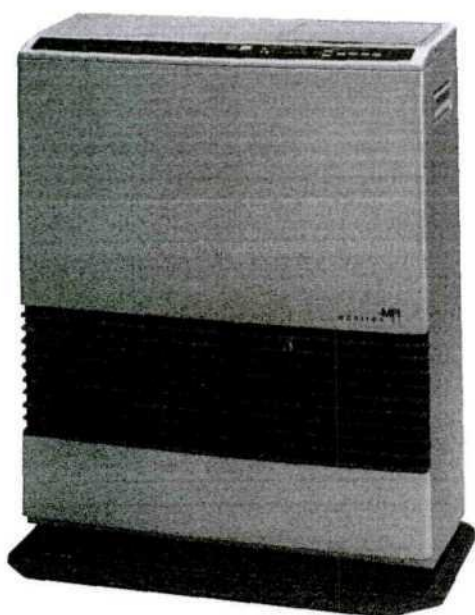
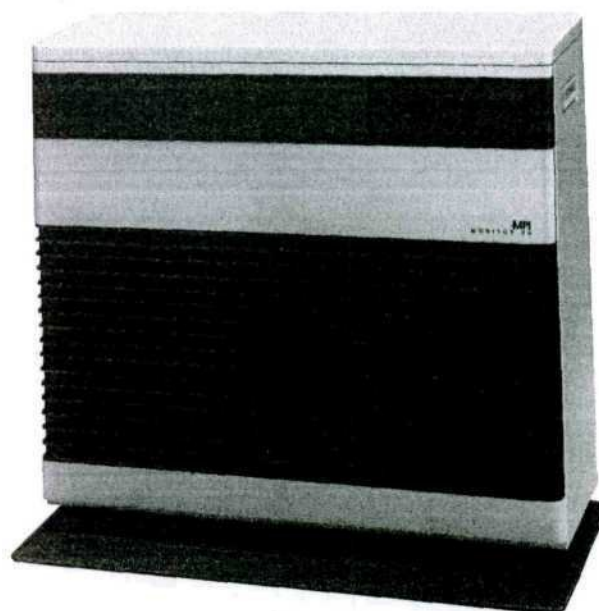


MONITOR HEATING SYSTEMS

Service Manual



MONITOR 21



MONITOR 40

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**Monitor Products, Inc.
7A & 7E Marlen Drive
Robbinsville, NJ 08691**

MONITOR HEATING SYSTEMS

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MONITOR HEATING SYSTEMS

Section 1: Description

1-1 INTRODUCTION

The Monitor Heating System represents "state of the art" technology and, although the heater is sophisticated, it is simple to operate, takes little time to maintain and requires minimum servicing.

The Monitor is a totally integrated heater consisting of a housing(cabinet),a combustion system, an air circulation system, a fuel delivery system and micro-computer system.

Redundant safety devices are included in the heater's design to protect the user from injury and the heater from damage.

This section describes the heaters and their components.

Since a number of components have multiple functions, a component may be described more than once.

1-2 PHYSICAL SPECIFICATIONS

Listed below, are the physical specifications that apply to the Monitors:

Monitor 40:

Height:26.6" (67.5cm)
Width:28.7" (73cm)
Depth:13.8" (35cm)
Weight:82 lbs (37kg)
Flue Pipe Hole:2 1/2"(65mm)diameter

Monitor 21:

Height:25.6" (65cm)
Width:20.9" (53cm)
Depth:12.4" (31.5cm)
Weight:55 lbs (25kg)Empty
Flue Pipe Hole:2 1/2"(65mm)diameter

1-3 FUNCTIONAL DESCRIPTION

An overview of the functional operation of the Monitors is diagrammed by Figure 1-1 and is described as follows:

Monitor operation always begins with a pre-purge and a pre-heat, which must be completed before operation can begin to heat the space.

by visually examining a series of indicators on the Control Panel.

A Temperature Selector Control permits the user to set the temperature to the level desired in the room.

Upon commencing heater shutdown, a post-purge is run.

All heating operations cease-except for the air circulation fan and the combustion fan which continue. The post-purge continues for three minutes after a flame goes out. At this point, heater operation stops completely.

Automatic operation of the Monitor 40 and Monitor 21 is controlled by a microprocessor with four sets of Time/Temperature programming per day.



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mechanisms.

1-5 SPILL TRAY

The Spill Tray:

- Protects the floor from damage resulting from fuel spillage.
- Provides a secure, tip-resistant heater base.

Metal retainers (2) secure the heater to the Spill Tray.

The legs are positioned within the circular indentations.

1-6 HEATER CABINET

A steel Cabinet holds and protects all internal components.

A number of primary parts are assembled to form this housing.

1-7 COMBUSTION SYSTEM

The Combustion System is responsible for the production of heat which is circulated into the room.

In the Combustion Systems a mixture of fuel and air is burned to produce heat. Air is drawn from outside the dwelling to Combustion Chamber. At the same time, fuel is metered from a storage tank into this same Combustion Chamber. Within the chamber, the air/fuel mixture is ignited to produce heat.

The Monitor combustion systems are safeguarded by a pair of overheat protector switches; They will shut down the heater (to protect it from damage) in the event of excessive heat build-up. The overheat protector switches reset automatically after cooling down.

1-8 COMBUSTION CHAMBER

This tall cylinder is positioned on the Heater Base. It is secured to the base by phillips head screws.

Connected to the Combustion Chamber are the igniter, (located within the chamber) a fuel line, the Heat Exchanger, and a Flame Sensor.

Within the Combustion Chamber are the Burner Pot, the Combustion Ring Assembly and the Burner Cap. Access to those internally-located parts is facilitated by a removable Service panel. A window on the panel lets the technician visually examine the combustion process (i.e. glowing igniter or proper flame color).

An airway, in the Cabinet Base, extends from the intake fan of the Combustion Blower to the hollow base of the Combustion Chamber. This airway channels air to the Combustion Chamber.

The Flame Sensor is mounted with two (2) phillips head screws onto the wall of the Combustion Chamber.

1-9 BURNER POT

Designed specifically to support combustion, the Burner Pot (refer to Figure 1-2) contains a series of air holes, an igniter tube (to accommodate the Igniter), and a fuel inlet fitting (interconnects the fuel line). It is secured to a mounting plate near the bottom of the Combustion Chamber.

The Combustion Ring Assembly is seated on three (3) screws in the Burner Pot.

1-10 COMBUSTION RING ASSEMBLY

This assembly is a special structure, designed to promote efficient combustion.

1-11 BURNER CAP

Secured by tabs and a screw on the Burner Pot, the Burner Cap "shapes" the flame into its configuration and height.

1-12 FLAME SENSOR

Mounted on the outside wall of Combustion Chamber, the Flame Sensor always supervises the flame.

1-13 IGNITER

Located within the igniter tube of the Burner Pot, the Igniter is designed to pre-heat the Burner Pot and to vaporize and ignite the air/fuel mixture to start the combustion process.

The Igniter is secured by a bracket and screw to the igniter tube. The cover plate is secured to the combustion chamber by three (3) phillips head screws.

1-14 COMBUSTION AIR SYSTEM

The Combustion Air System channels air to and from the heater.

Outside air is drawn into the heater by the Combustion Blower through an airway to the Combustion Chamber.

A Combustion Blower draws the intake air into the through a Flue Pipe. This air enters the Combustion Chamber at the Burner Pot and mixes with the fuel support combustion. Remaining air is heated and is drawn into the Heat Exchanger.

As the heated air passes through the Heat Exchanger, an Air Circulation Fan blows room air past the Heat Exchanger and out again into the room, heating passing air by convection. Exhaust vapors exiting from the Heat Exchanger are vented through the Flue Pipe.

A deterioration of air pressure at the Air Pressure Switch is an abnormal condition; the heater is shut down by the malfunction.

MONITOR HEATING SYSTEMS

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1-15 FLUE PIPE

Flue Pipes are available in three (3) sizes. This provides the flexibility to meet the installation requirements for dwelling of various wall thicknesses.

One side of the Flue Pipe contains a "T"-shaped fitting consisting of four ports. This side is mounted on the interior wall of the dwelling. The pipe side of the Flue Pipe is vented outside the dwelling.

The Flue Pipe Assembly consists of two concentric tubes. Outside air is drawn through the cylindrical space between the tubes.

Combustion by-products are vented through the inner tube.

As the cool air enters, it is heated by the hot air that is exiting the system.

A large-bore, flexible hose connects the air inlet port on the Flue Pipe with the Combustion Blower; a cloth-covered metal pipe connects the Combustion Blower with the exhaust outlet on the Flue Pipe.

IMPORTANT: If extension kits are utilized, use the correct damper as follows:

Extension kit	M-40	M-21
Up to 3 elbows with Extra Short Extensor kit Length: 11 ¹ / ₂ " - 7 ¹ / ₆ "	"S" damper	"S" damper
Up to 3 elbows with Short Extension Kit Length: 11 ¹ / ₂ " - 20 ¹ / ₄ "	"S" damper	"S" damper
Up to 3 elbows with Medium Extension Kit Length: 20 ¹ / ₄ " - 38"	"E" damper	unused
Up to 3 elbows with Long Extension Kit Length: 38" - 73"	"E" damper	unused

1-16 COMBUSTION BLOWER

The combustion blower on the Monitor 21 is a dual function fan.

The intake fan draws in outside air thru the flue pipe for internal combustion. The cooling fan which runs on a common shaft with the intake fan circulates air inside the heater cabinet to keep internal components cool.

The Monitor 40 combustion blower has a two stage intake fan.

Burner modes control fan speeds and the solenoid damper in the blower casing. Those functions are as follows:

Table 1-1 COMBUSTION AIR CONTROL

Burn Mode	Fan Speed	Solenoid Damper
High	High	Off (Open)
Medium-High	High	Off (Open)
Medium-Low	Low	On (Close)
Low	Low	On (Close)

1-17 HEAT EXCHANGER

An inlet at top of the Heat Exchanger permits the heated air to travel from the Combustion Chamber into the exchanger.

An outlet, at the bottom of the exchanger, permits combustion by-products to be vented to the Flue Pipe.

While moving through the Heat Exchanger, the hot air within the exchanger heats the outside metal walls. The hot metal walls, in turn, heat air that is pushed past the exchanger and is circulated into the room. An air baffle, directly in front of the exchanger, deflects the heated air upwards, and out, through the louver assembly.

A pair of Over-Heat Protector Switches protect the heater from damage due to excessive heat built-up.

1-18 AIR CIRCULATION FAN

Both Monitor circulation fans are driven by two-speed motors and are designed to circulate the heated room air.

If the heater is running in low and medium-low burn modes, the fan also runs at low-speed; in medium-high or high burn modes, the fan advances to high-speed.

Operation of the fan is controlled by the micro-processor and fan thermostat switch (52°C/126°F...on, 35°C/95°F...Off)

Physically assembled with a protective wire cage for the Monitor 40 and metal mesh cage for Monitor 21, the entire fan assembly is secured to a bracket on the rear of the Heater Cabinet.

A metal conduit, at the rear of the heater, protects the fan wiring from damage.

1-19 AIR PRESSURE SWITCH

This switch consists of a rubber diaphragm which senses changes in air pressure (it is connected to the Combustion Blower) and normally-open, micro switch.

Should an abnormal pressure differential exist, the switch opens to disable the circuitry that controls

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the supply of fuel. Since the flow of fuel to the Burner Pot is cut off, the flame extinguishes (after all fuel currently in the line has been consumed), and the Burner Status Indicators blink.

This safety mechanism can be triggered by several conditions:

- Leak or loose connection in air line
- Leak, loose, or broken tubing which connects the Air Pressure Switch with the Combustion Blower
- Clogged or blocked Air Line
- Blocked or clogged Flue Pipe
- Intake port of Combustion Blower is blocked.
- Combustion Blower is inoperable

1-20 FUEL DELIVERY SYSTEM

Fuel Delivery is a very important aspect of the Monitor's operation.

The fuel flow must be maintained at a level corresponding to the burn mode, so that combustion can be conducted efficiently.

Fuel moves by gravity-flow from the external fuel storage tank or the capsule fuel tank to the Fuel Constant Level Valve.

The Solenoid Pump meters the flow of fuel from the Fuel Constant Level Valve to the Burner Pot.

The metered flow of fuel is carried to the Burner Pot by a copper fuel line.

1-21 EXTERNAL FUEL TANK

The Monitor 21 gives the user the option of either using the internal capsule tank or hooking up to an external fuel tank.

Fuel for the Monitors can be stored in, and fed from an external storage tank. The tank, which generally is dealer installed, should contain a shutoff valve, a fuel filter and a vent. Installation of the tank should conform to local regulations and to the specifications and guidelines documented in this Service Manual.

1-22 FUSIBLE LINK VALVE

Basically, the Fusible Link Valve is a safety mechanism that cuts-off fuel to the heater in the event of an overheat condition at the valve.

The fusible link valve is mounted as a standard item on the Monitor 21. Located outside the rear of the Heater Cabinet, the Fusible Link Valve is a spring-loaded device that cuts off the supply of fuel to the heater when the temperature level (at the valve) exceeds a predefined maximum limit.

An inlet on the bottom of the valve allows fuel to

pass into the heater. The handle—which can also manually be opened or closed—sits on a spring-loaded stem which contains a low-melting point alloy.

The fusible link valve can be externally mounted on the Monitor 40 if required.

1-23 FUEL CONSTANT LEVEL VALVE

This valve has an automatic shutoff safety mechanism and a Fuel Set Lever. The safety mechanism prevents fuel from flooding or overflowing from the fuel reservoir. The Fuel Set Lever resets the float so the Fuel Constant Level Valve can resume operation.

The fuel reservoir is a tank which contains a float assembly, a safety mechanism, and a priming lever.

Both the Monitor 21 and 40 fuel control valves are basically the same, however they are of different size and material and can not be interchanged.

Fuel enters the Fuel Constant Level Valve through an inlet at the bottom of the reservoir. As the level of fuel rises, it passes through a filter (which removes most particles and foreign matter from the fuel), flows up through an open inlet valve and enters the tank.

IMPORTANT: The Fuel Constant Level Valve filter should be cleaned or replaced periodically. Time intervals will depend on purity and quality of fuel.

Within the Valve, a float mechanism controls the level of fuel that will be permitted to the reservoir. As the fuel level drops, the float drops down to increase the inlet valve opening to admit more fuel into the valve. When the fuel level reaches its maximum volume, the float rises to shut the inlet valve.

In the event that fuel within the reservoir rises to an abnormally high level, a float within the reservoir rises to trip a safety lever. This safety lever drops to prevent fuel from entering into the reservoir.

Should a foreign substance cause the inlet valve to stick (or prevent it from opening), the Fuel Set Lever is utilized to free the valve and to admit fuel to the reservoir.

CAUTION: Care must be taken to prevent dust, dirt, or other debris from clogging or blocking the inlet valve.

1-24 SOLENOID PUMP

The Solenoid Pump is mounted the Fuel Constant Level Valve, controlled by a microprocessor, and

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four modes (High, Medium-High, Medium-Low, Low) fuel flow is delivered to the Burner Pot.

1-25 ELECTRICAL SYSTEM

Electrical power is supplied to the Monitor to run the Microprocessor and the other electrically-energized component.

Electrically operation of the Monitor can be thought of as having the following eight (8) distinct phases: plug in; turn-on; pre-purge/pre-heat; ignition; pre-combustion; heating; Shutdown and post-purge.

All electronic diagrams, Such as wiring diagram, circuit board layout, and electrical schematic can be found in Section 7 of this Service Manual.

1-26 MICROPROCESSOR

Principally consisting of a 64-pin Integrated Circuit, the Microprocessor provides safety timings, controls relays and provides clock and thermostat functions for the Monitor heater. A component layout of the Printed Circuit Board is found in Section 7 of this Service Manual.

1-27 TEMPERATURE SENSOR

The sensor which is capable of sensing room temperature within a range of 42°F to 96°F, can be left mounted on the back of the heater cabinet or be wall mounted.

Approximately 6¹/₂' (about 200 cm) of No. 20 AWG Wire is supplied with the sensor to facilitate wall mounting the sensor in a favorable location.

1-28 SAFETY MECHANISMS

Several safety mechanisms have been built into the Monitor Heating System. These devices protect the user against personal injury, protect the heater against damage, and shutdown the heater if a malfunction occurs.

1-29 CLOTH COVERED EXHAUST PIPE

Insulating cloth covers are to be placed over all metal surfaces of the Exhaust Line during installation.

Since combustion by-products are vented at elevated temperatures, the Exhaust Pipe will become hot during operation. The insulating cloth covers protect the user from burn hazards associated with accidental contact with these heated metal surfaces.

During installation make sure that all Exhaust Lines are tight. Do not operate the heater without the insulating covers.

1-30 AIR CIRCULATION FAN GUARD

This guard is an integral part of the fan assembly.

The guard protects the user against physical injury which could occur from accidental contact with revolving metal fan blade.

1-31 FUSE

2-amp. and 10-amp., 125VAC, fuses protect the heater from damage resulting from power overloads.

In the event of a power surge or internal wiring hazards, the fuse opens and power to the heater is cut off.

The electrical outlet into which the heater is connected should be protected by at least a 15-amp. fuse or circuit breaker.

1-32 OVERHEAT PROTECTOR SWITCHES

Connected in series, two (2) normally-closed Overheat Protector Switches safeguard the heaters against damage due to overheating.

The Monitor 21 switches are rated 110°C (230°F). The Monitor 40 switches are rated 115°C (239°F). Should a Monitor overheat (internal temperatures rise beyond 110°C (230°F) on the Monitor 21, 115°C (239°F) on the Monitor 40) either or both switches will open to shut down the heater. After extinguishing the flame, the Burner Status indicators continue to blink. The Overheat Protector Switches will automatically reset after cooling down.

Once the heater has cooled to 80°C (176°F), the system can be restarted. To restart the Monitor, proceed as follows:

- A. Press ON/OFF Switch to OFF.
- B. Allow heater to cool.
- C. Troubleshoot the cause of the overheat.
- D. Press ON/OFF switch to ON
- E. Proceed with normal operation.

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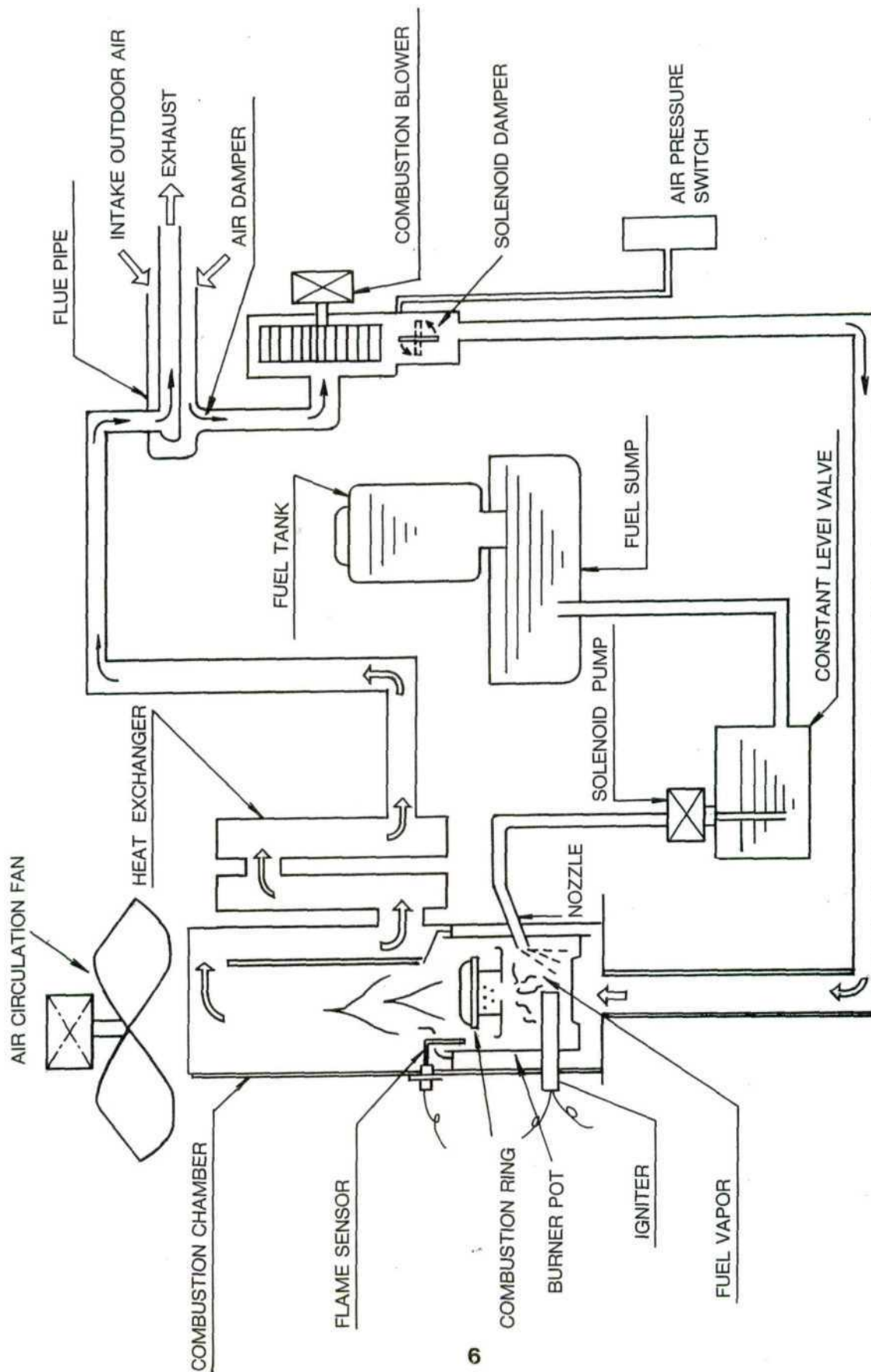


Figure 1-2 ELEMENTS OF COMBUSTION SYSTEM (MONITOR 21)

MONITOR HEATING SYSTEMS

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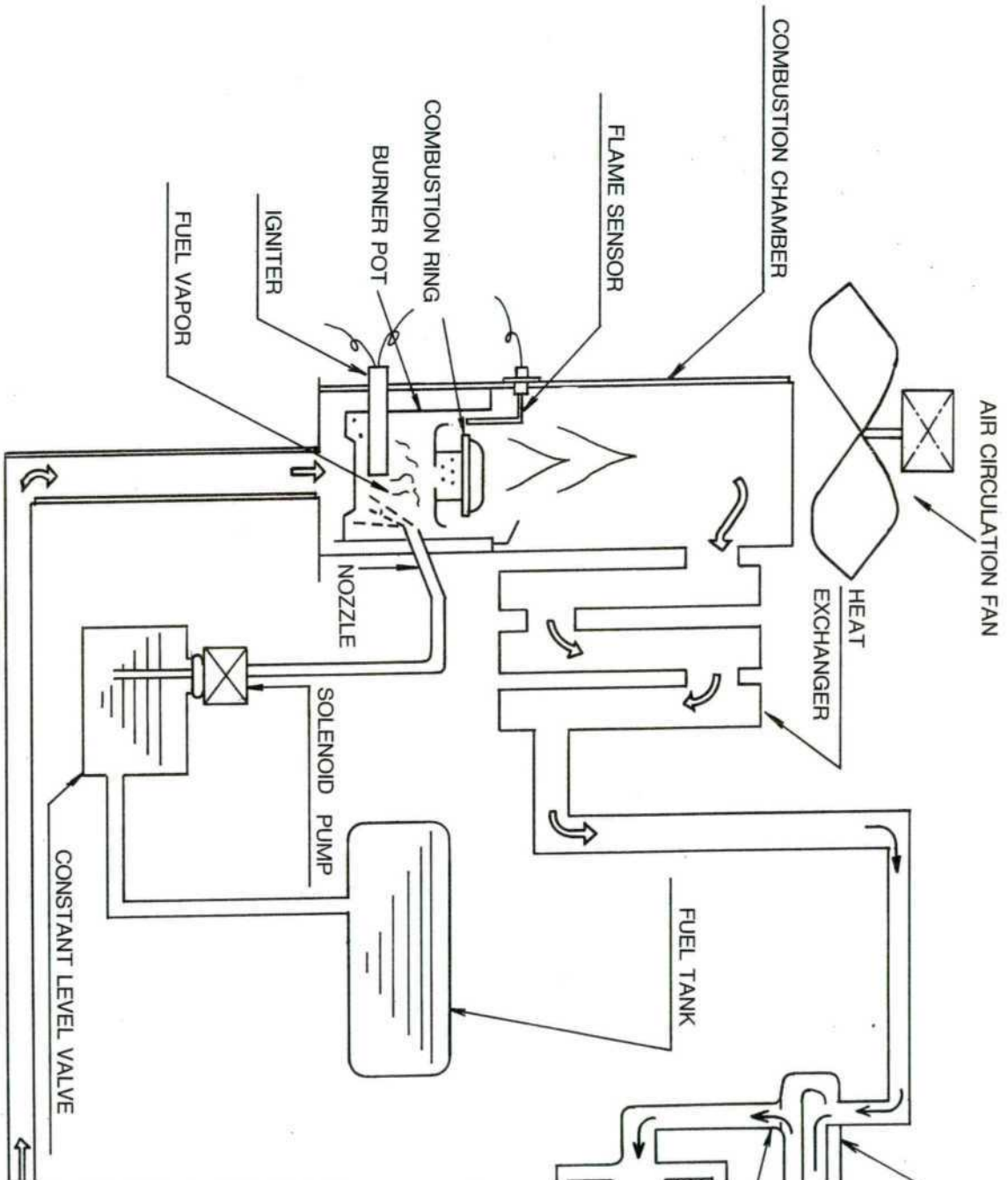


Figure 1-3 ELEMENTS OF COMBUSTION SYSTEM (MONITOR 40)

MONITOR HEATING SYSTEMS

Section 2: Installation

2-1 INTRODUCTION

Installing the Monitor System at the user's location can be performed quickly and economically. The Monitor 21 can be used as either an internally fueled (capsule tank) or remotely fueled System. The Monitor 40 model is strictly a remotely fueled system and both are externally vented. As such both need the installation of an externally vented intake/exhaust system and if remotely fueled, will need the installation of a remote fuel storage tank.

By completing each step of the easy-to-follow installation instructions (each step should be completed in the exact order specified), the Technician is directed through the installation process.

This section contains all relevant installation information including:

- Installation specifications
- List of installation tools
- Alternative types of venting systems (and installation procedures for each)
- Basic requirements for fuel tank installation
- Instructions to install the Monitor System

IMPORTANT: Before beginning installation of the Monitor vented heating system (including any electrical wiring and fuel supply equipment), check local building, electrical, mechanical and fire codes. The requirements of these codes must be followed to insure lawful installation and use.

The heater can be located almost anywhere within the dwelling provided that electrical, fuel, and exhaust specifications are met.

2-2 PHYSICAL PLACEMENT OF HEATER

In addition to the space taken up by the heater, interior space must also be reserved for free air circulation. Remove all combustibles from the heating area.

Unless building or fire codes dictate otherwise, the Monitor system can be placed on any floor surface (including carpeting or other combustible material) and provide safe operation.

2-3 DRILLING REQUIREMENTS

Through-the-wall Flue Pipe installation requires that a 2 1/2" (65mm) hole be drilled through the dwelling wall (interior to exterior). The hole must be pitched downward toward the outside at an approximate angle of 2" (about 1/2" per foot). The appropriate wall area (in which hole will be drilled) must contain no internal obstacles such as piping, wiring, air ducts, or studs.

RECOMMENDED TOOL KIT FOR MONITOR HEATER SERVICE TECHNICIANS

- 1) #2 Phillips Head Screwdriver
- 2) Steel Tape Measure
- 3) Felt Tip Pen or Pencil
- 4) Caulking Material (exterior grade)
- 5) Electrical Drill
(reverse capability recommended)
- 6) Hole Saw, Saber (Jig) Saw, or other appropriate tool for cutting a 2.5" diameter hole for flue pipe
- 7) Rubber Clipping Tool
- 8) Long Drill Bit—1/2"
- 9) #2 Standard Screwdriver
- 10) Adjustable Wrenches (various sizes)
- 11) Copper Tubing Cutter
- 12) Copper Tubing Flaring Tool
- 13) V.O.M. (Volt, OHM. Meter with shielded probes)
- 14) Level
- 15) Plumber's Pipe Thread Tape
- 16) Small assortment of Self-Tapping Screws
- 17) Assorted Pliers (Slip Joint, Needlenose, Cutting, Lock Joint)
- 18) Phenolic Probe or Insulated Screwdriver
- 19) Supply of 125V, 3 Amp fuses
- 20) Floor mat to cover carpeting
- 21) Quart size pan for draining fuel

2-4 POWER REQUIREMENTS

WARNING

THE MONITOR POWER CORD MUST BE PLUGGED INTO A DIRECTLY ACCESSIBLE WALL OUTLET. DO NOT USE AN EXTENSION CORD TO MAKE THIS ELECTRICAL CONNECTION.

Line current to the system should be 120 VAC at 60 Hz. The electrical system should be protected against current overload by means of at least a 15-ampere fuse or circuit breaker.

NOTE: The wall outlet should supply electricity for the Monitor system only. Do not connect any other electrical appliance to it.

CAUTION: In some installations, it may be best to hard-wire the heater to the house circuits. A competent, licensed electrician should do this.

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2-5 FUEL TANK REQUIREMENTS

WARNING:

INSTALLATION OF ANY REMOTELY LOCATED FUEL TANKS MUST COMPLY WITH ALL LOCAL STANDARDS AND/OR BUILDING CODES.

Heater fuel (crystal clear kerosene only) can be stored in remotely located storage tanks ranging from 55 gallon drums to 275 gallon tanks. When using large tanks a pressure regulator with a max. of 2.5 PSI should be installed near heater inlet.

CAUTION: In some installations, it may be better to install permanent fuel tank plumbing. A licensed Plumber should do this.

2-6 TEMPERATURE SENSOR WIRING REQUIREMENTS

A wall-mounted temperature Sensor gauges room temperature and automatically regulates the heating cycles of the Monitor System.

The standard sensor wire is 6³/₄' long and can be left mounted on the back of the cabinet as shipped. If this is not practical the sensor can be mounted on a wall.

CAUTION: If sensor is to be mounted remotely be careful not to place it in direct sunlight, on uninsulated exterior walls in drafty areas etc., as this will create an inaccurate temperature reading.

2-7 BUILDING CODES

Fire regulations, electrical and other local building codes may govern the installation and use of a vented heater and related fueling systems. Prior to installation, check and comply with all codes.

2-8 UNPACKING

Save all shipping materials until the Monitor has been completely installed and is working properly.

- Cut the two plastic ribbons that hold the shipping carton together.
- Remove the top.
- Remove from the shipping carton the Cardboard (drilling) Template and the Owner's Guide.

NOTE: The Dealer should complete the Registration Card at time of customer purchase and return it to Monitor Products, Inc. as soon as possible.

- Remove the spill tray from shipping carton, and remove the plastic bag.
- Remove the plastic bag covering the hearer.
- Remove the plastic bag containing the heater parts, and set it aside.
- Remove the Flue Pipe from the rear of the heater. When ready to install, separate Flue Pipe from cardboard packing materials.
- Firmly grasp cabinet handles (one on each side of heater cabinet) and lift heater off the cardboard shipping base.
- Check for parts as listed in Monitor Owners Guide.

IMPORTANT: Only the standard-size Flue Pipe is shipped with the heater. The Monitor dealer will also stock Medium Flue Pipes, Window Kits, Extension Kits, and other accessories that may be required for non-standard installations.

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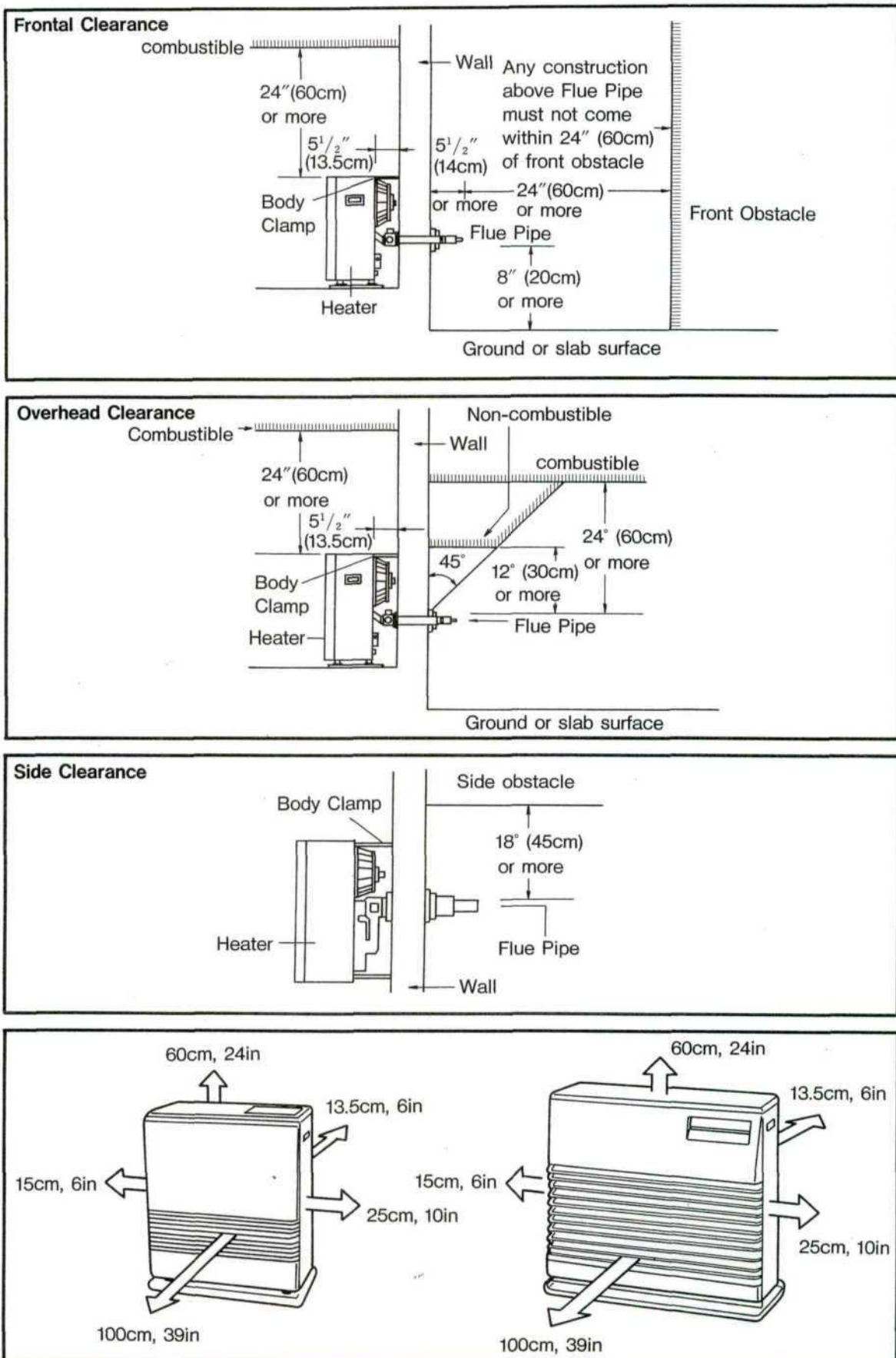


Figure 2-1 FLUE PIPE CLEARANCES

MONITOR HEATING SYSTEMS

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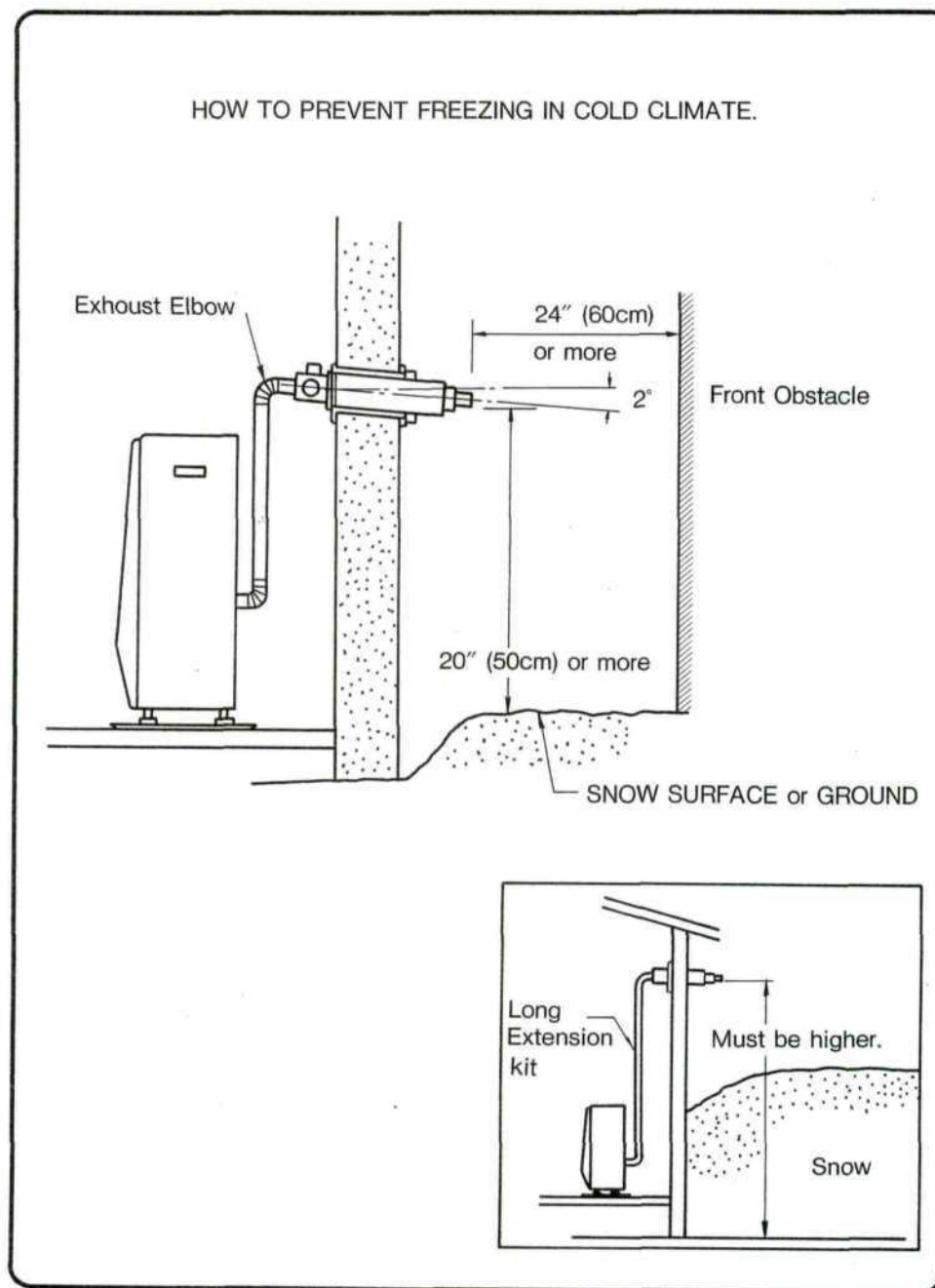


Figure 2-2 FLUE PIPE CLEARANCES

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NOTE: After using the installation template as a guide for drilling the flue pipe hole, the Monitor Flue Pipe can be normally installed according to the Illustration procedure in the Monitor Manual.

Just in case the template was misplaced, the approximate flue pipe hole location measurements are as follows:

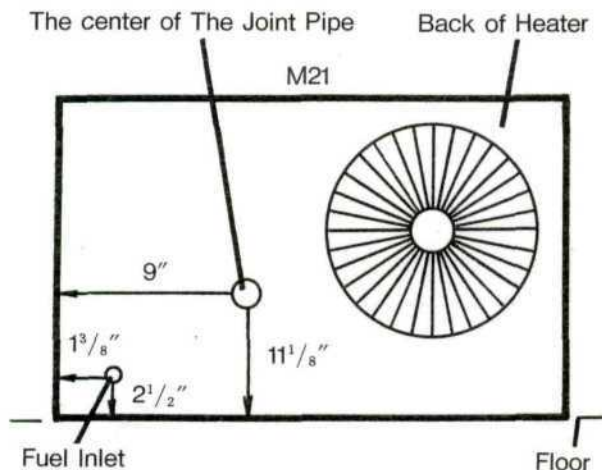
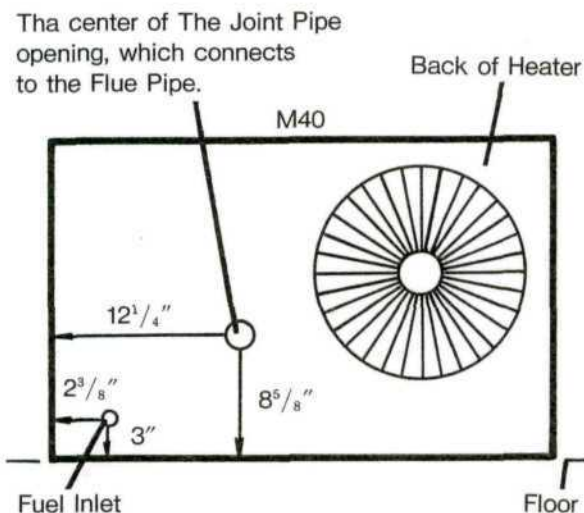


Figure Figure 2-3

2-9 INSTALLATION OF FLUE PIPE WINDOW KIT

A window kit makes it possible to vent the heater from dwellings in which through-the-wall venting is neither practical nor possible.

The Window Kit is available in two sizes. The Short Window Kit accommodates windows from 20 to 32" wide; the Long Window Kit accommodates windows from 31 to 50" wide.

NOTE: The procedure below describes how a Window Kit is installed in a double-hung window. The Window Kit can also be installed in a vertical, sliding type window.

Install the Window Kit in the manner outlined below:

STEP 1: Install Flue Pipe in Window Kit

- Push the rubber seal into the Flue Pipe hole on the window kit frame. The hole on the seal should be positioned at the exterior side of the frame.
- Using the four (4) Phillips head screws, fasten the spacer to the frame.
- With the arrow on the Flue Pipe pointing UP, align the screw holes on the Flue Pipe with those on the Spacer. Secure with three (3) Phillips head screws.

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STEP 2: Install Window Kit in the Window

IMPORTANT: Prior to installation, clean the window frame of all dust, dirt, and debris.

- A. Raise the lower window
- B. Place the window kit frame into the innermost track of the window.
- C. Expand the frame until it fits loosely within the width of the window; it may be necessary to loosen the large set screw on the frame in order to do so.
- D. Slightly lift window kit frame. Slide the L-Adapter under the frame and position it at the point where the inner and outer frame meet.
- E. Expand the frame to fit the window tightly. Adjust the position of the L-Adapter, if necessary. Tighten the set screw to secure the frame. Secure the L-Adapter to the window sill with two (2) wood screws.
- F. Lower the window firmly down upon the top of the Window Kit frame.
- G. Measure the width of the upper (outer) window (which is located in the outer track). Cut a length of the Rubber Packing to this size. Remove the protective backing and firmly mount it onto the underside of the outer window.

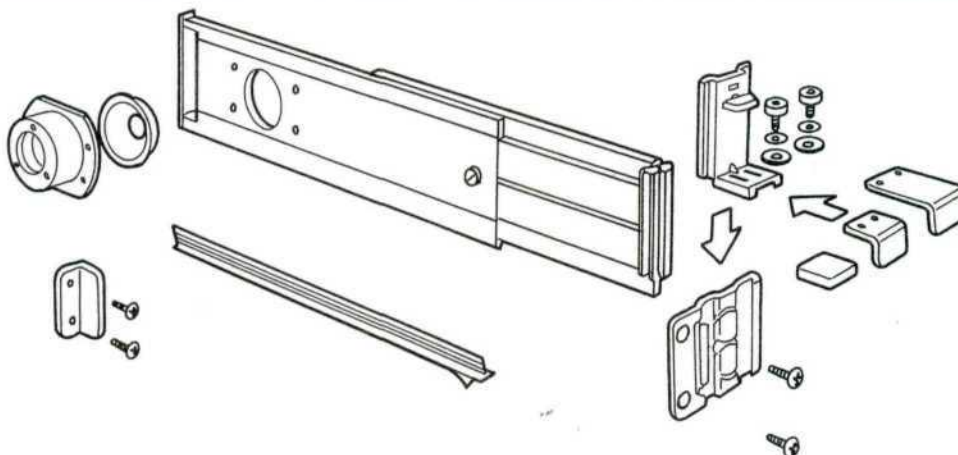
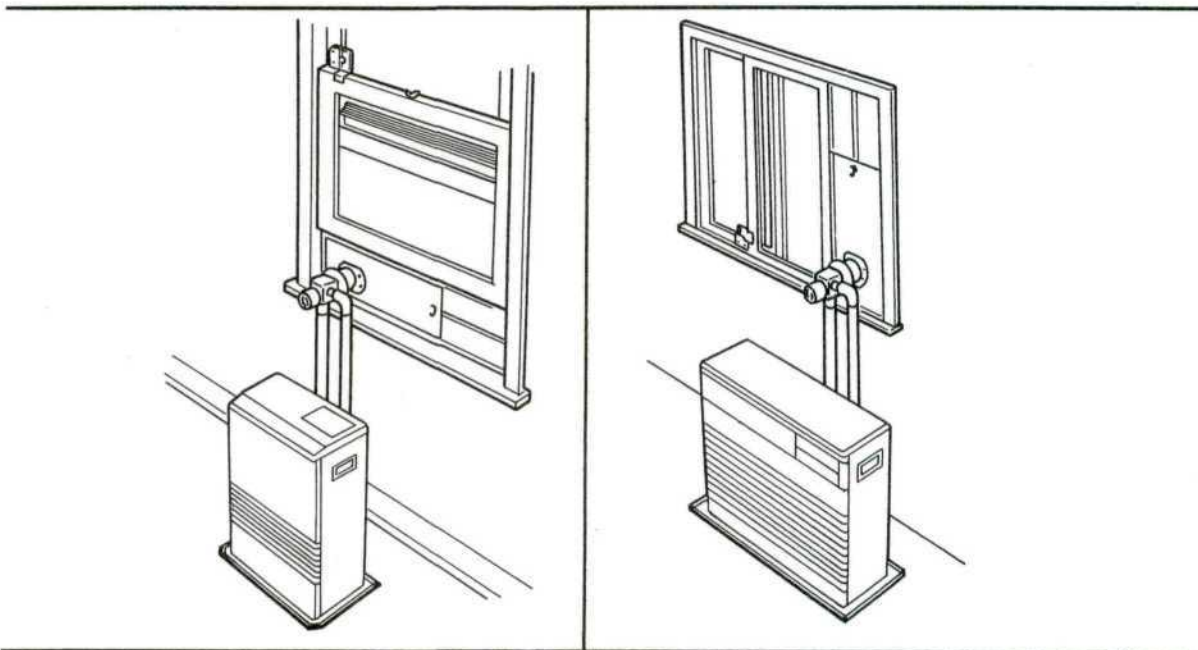


Figure 2-4

MONITOR HEATING SYSTEMS

Section 2: Installation

STEP 3: Install Window Lock

A special window lock replaces the usual clam-shell lock.

To install the window lock, proceed as follows:

- A. Turn locking lever to left and disengage lock from lock bracket.
- B. Attach lock bracket to left-hand side of upper window frame. Use the two wood screws provided.

NOTE: If the lock bracket prevents the lower window from sliding upward, notch the bracket into the upper window frame.

- C. Slip lock into lock bracket.

IMPORTANT: Window can be locked by turning locking lever to right; to open, turn locking lever to left and remove lock from bracket.

- D. Two adjustable-position stops are supplied to accommodate various window sash thicknesses. If short stop is too small, remove two retaining screws and brackets which hold the short stop to the underside of the lock. Remove the short stop and substitute the long stop. Adjust to proper position, and secure with screws and washers previously removed. (Before securing the stop to the window, remove the protective backing and firmly stick the stop packing onto the underside of the stop.)

NOTE: Windows with deep sills may require the use of an extra intake and exhaust elbow to provide clearance for flue pipe hook up. A piece of the air intake line can be cut to join the two intake elbows together.

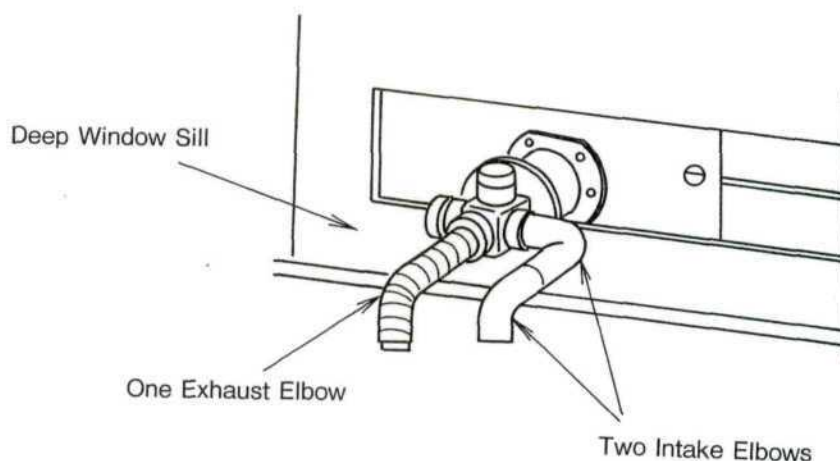


Figure 2-5

MONITOR HEATING SYSTEMS

Section 2: Installation

2-11 INSTALLING AN EXTENSION KIT

Installing an Extension Kit requires the construction of an air line and the exhaust line. The air line is connected between the Air Supply Elbow at the rear of the heater and the air inlet port on the Flue Pipe. Similarly, the exhaust line is connected between the joint pipe at the rear of the heater, and the exhaust port on the Flue Pipe.

IMPORTANT: The PVC air line is longer than the exhaust line and may need to be cut to size. Be sure, however, to thoroughly deburr all rough edges.

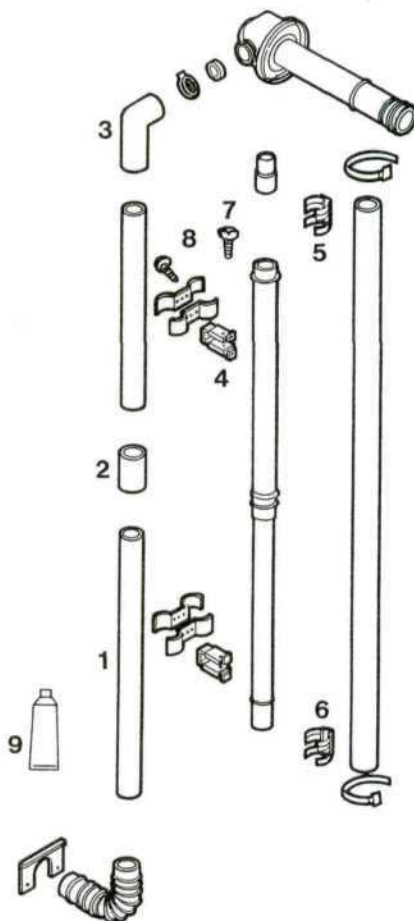


Figure 2-6 COMPONENTS OF EXTENSION KIT

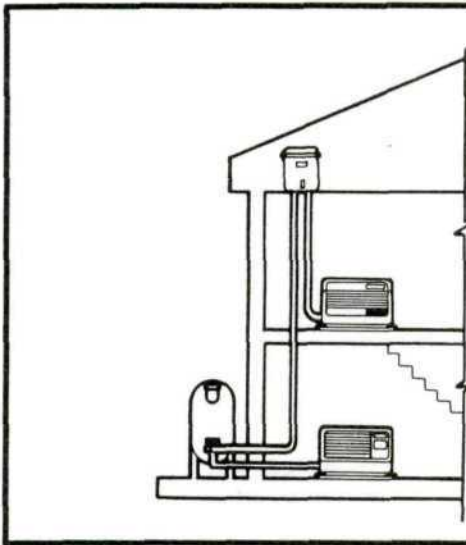
ITEM#	DESCRIPTION	ITEM#	DESCRIPTION
1	PIPE, Air supply	6	PIPE CLAMP, Bottom
2	JOINT, Air line	7	SCREW, Legs, mounting
3	ELBOW 90° Air line	8	SCREW, Pipe Clamp
4	LEG, Wall-standoff	9	BOND, Adhesive
5	PIPE CLAMP, Top		

MONITOR HEATING SYSTEMS

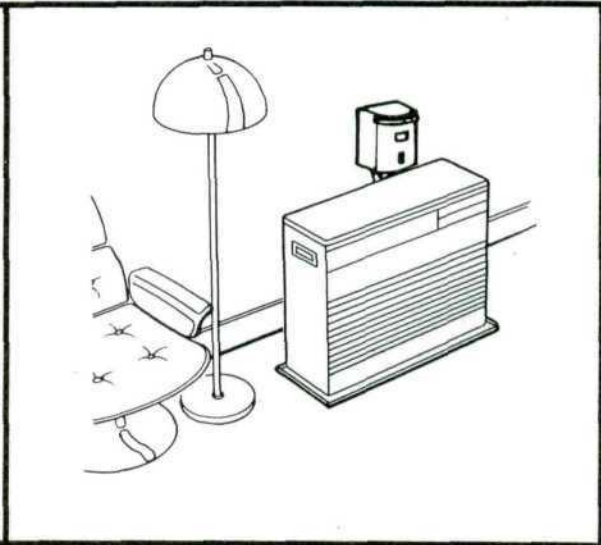
Section 2: Installation

2-13 TYPICAL MONITOR LIFTER PUMP INSTALLATIONS

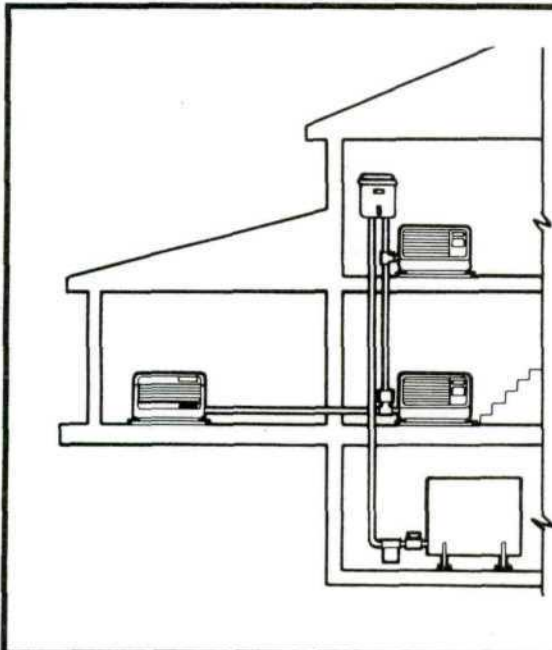
For more detailed information look under Kerosene Lifter manual.



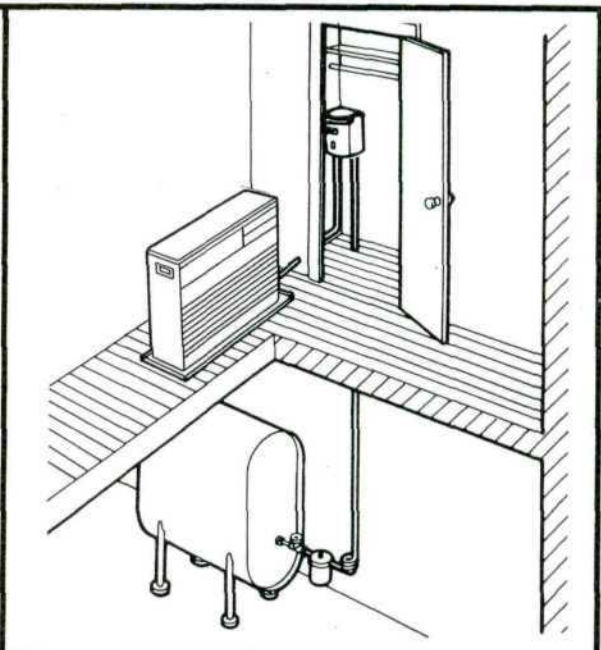
MONITOR™ KEROSENE LIFTER



MONITOR™ KEROSENE LIFTER
(CAN BE POSITIONED BEHIND UNIT)



MONITOR™ KEROSENE LIFTER



MONITOR™ KEROSENE LIFTER/GRAVITY

Figures 2-7

MONITOR HEATING SYSTEMS

Section 2: Installation

2-14 USES FOR THE ELBOW ADAPTER KIT

Convert from Monitor 20/30 to 21/40 using an elbow adapter Kit (part#8213) and utilizing existing flue pipe installation.

PARTS LIST EXPLODED

Ref. No.	Name of Part	No in Unit
1	Exhaust Pipe Clamp	
2	Exhaust Elbow	1
3	Exhaust Joint	1
4	Joint Supporter	1
5	Heat Insulation Cover	1
6	Self-Tapping Screws	2
7	Hose Clamp (this part comes with your Monitor™ Heater)	
8	Air Damper (this part comes with your Monitor™ Heater)	
9	Flue Pipe (this part comes with your Monitor™ Heater)	

- Remove Monitor 20/30 heater and flue pipe.
- Install Monitor 21/40 flue pipe into sleeve.
- Slide the exhaust elbow onto the exhaust port opening on the rear of the heater. (To locate exhaust port opening, see your Monitor Owner's Guide.)
- Secure the exhaust elbow by attaching the exhaust pipe clamp to the heater cabinet with two self-tapping screws.
- Cover the adjustable exhaust pipe with heat insulation cover.

- Remove metal cap on side mounted exhaust port of flue pipe and replace into the port (the Monitor 21/40 is now ready to be positioned into place.)

NOTE: Be sure the exhaust elbow is firmly fixed on the flue pipe with a joint supporter.

- Insert air supply elbow opening over flue pipe air intake flange and secure with hose clamp.

NOTE: The Standard Air Damper is installed over the flue pipe "air intake flange." (To locate flue pipe "air intake flange", see your Monitor™ Owner's Guide.)

Elbow adapter kits may also be used to raise a flue pipe high enough to clear certain base board heating systems.

2-15 FUEL TANK INSTALLATION

Pictorial views of alternative types of storage facilities and delivery systems are illustrated (Figure 2-10).

Since fuel storage tank installation techniques vary from place-to-place (often dependent upon applicable codes), a particular installation procedure cannot be specified. However, certain criteria govern the fuel hook-up of the Monitor. Use the following check list as a guide to the fuel storage facilities:

WARNING:

USE ONLY CRYSTAL CLEAR KEROSENE. NEVER USE GASOLINE, WHITE GAS, CAMP FUEL OR OTHER FLAMMABLE LIQUIDS. USE OF SUCH FUELS CAN RESULT IN AN EXPLOSIVE FIRE AND CAUSE SEVERE INJURY.

Fueling Options Available

Fueling of the Monitor Heating Systems can be accomplished in one of 3 ways:

- Capsule Tank (on the Monitor 21).
- Gravity Fed Large Capacity External Tank: Practical for large heating needs where bulk delivery of kerosene is available. This system should be installed by a qualified plumber or fuel supply technician.
- *3. Large Capacity External Tank with Pump: For large heating needs where a gravity fed system is not practical. An electric pump, the Monitor™ Kerosene Lifter, especially designed for use with Monitor heating systems.

*if a pumping system is used to supply fuel, the inlet pressure to the heater must not exceed 2.5 psi.

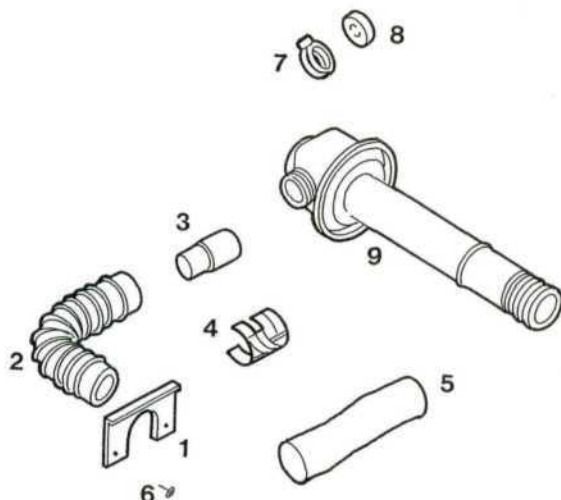


Figure 2-8

MONITOR HEATING SYSTEMS

Section 2: Installation

To install a large capacity, gravity fed external tank, follow the instructions below. Use of a qualified installer is recommended.

- Installation height of the bottom of the fuel tank should be 16 inches or more above the floor surface on which the heater stands. This insures that inlet fuel pressure will be sufficient. The top of the fuel tank should be no higher than $8\frac{1}{2}$ feet above the floor under the heater. This insures that inlet fuel pressure will not be excessive.
- The horizontal length of piping should not exceed 100 feet and should be free of sharp bends or obstructions.
- Piping should include no inverse U-type bends (to avoid air locks, which could block the fuel supply).
- Only $\frac{3}{8}$ -inch OD copper tubing should be used. The tubing should be bent carefully to avoid crimping.
- A fuel filter is recommended for use on the fuel line near tank, and a shut-off valve should be installed at the tank.
- Flare connections should be used at the fusible link valve connection on the heater and at the fuel filter to be installed at the tank.
- The fuel tank should be located no closer than 6 feet to a source of heat.
- The fuel tank should have an opening for filling on the top and a vent with a weather-proof cap on the side. On some tanks the vent and fill spout use the same opening.

55, 100, and 250 gallon tanks must contain:

- Shut-off valve at tank outlet
- Disposable fuel filter (protects heater against condensation and other impurities)
- Fueling inlet (protected by weather-proof cap)
- Ventilation outlet
- Clearance of at least 6' from any source of heat

Allowable Height Dimensions:

- Bottom of tank—at least 16" above floor holding heater (maintains sufficient pressure)
- Top of tank—maximum of $8\frac{1}{2}$ ' above floor holding heater (prevents excessive line pressure)
- Position of Lifter—more than 8' above fuel inlet of heater requires pressure reduction valve.

RECOMMENDATION

Pipe fittings in the fuel supply to the Monitor heating systems should be sealed with pipe thread tape. The supply line from the tank to the Monitor™ Kerosene Lifter must be absolutely air tight. 275 gallons and bigger tanks should have a 2.5 P.S.I. max pressure reducer to avoid excessive pressure at heater inlet.

2-16 HEATER INSTALLATION

The Monitor heaters can be physically situated on carpeting or other combustible flooring with complete safety. The selected heater site must be accessible to an electrical outlet, must support free air circulation (both internal and external), and must not contain combustible materials in the heater's immediate vicinity.

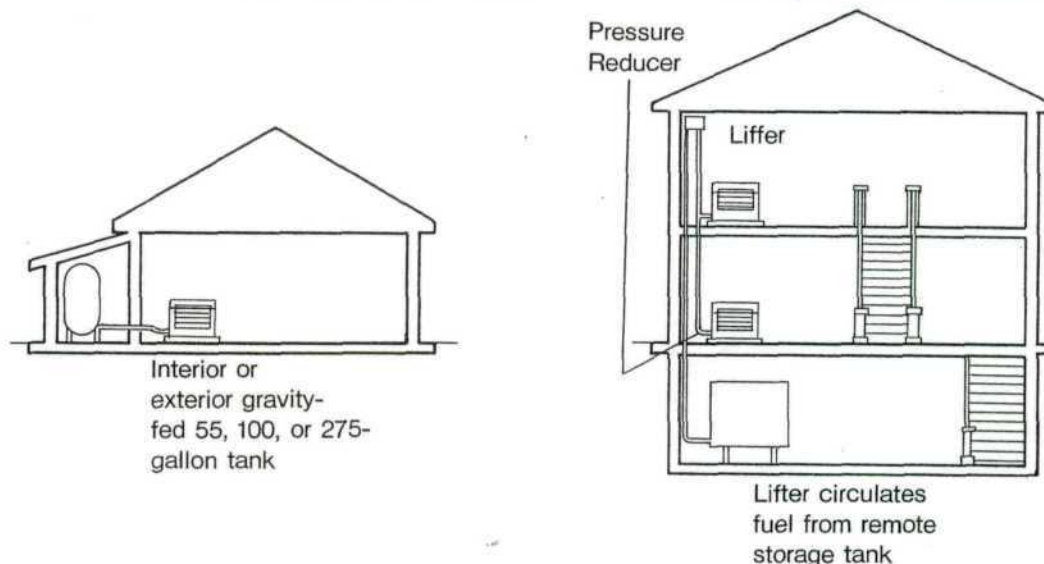


Figure 2-9 ALTERNATIVE SOURCES OF FUEL STORAGE

MONITOR HEATING SYSTEMS

Section 2: Installation

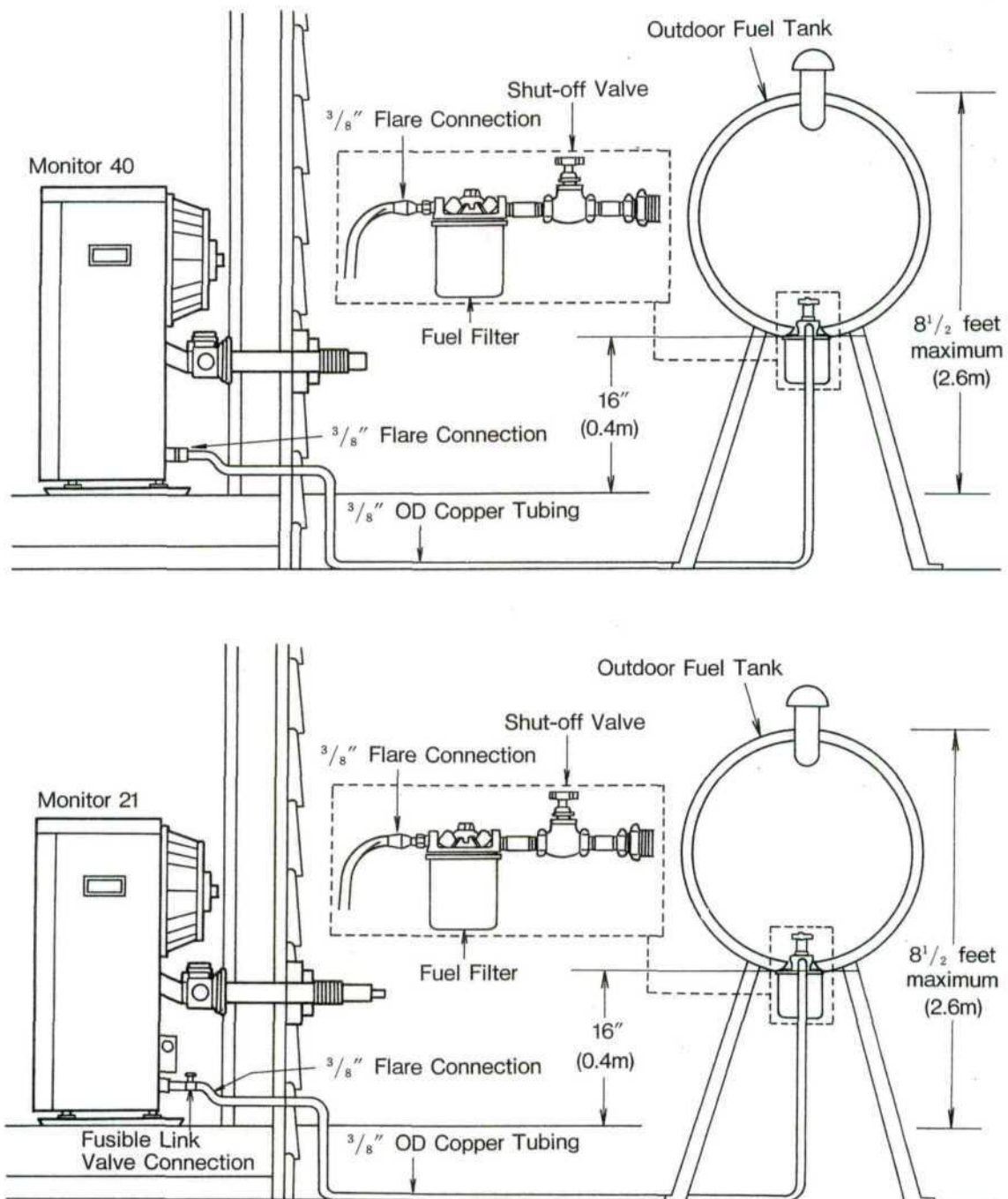


Figure 2-10 TYPICAL FUEL LINE CONNECTIONS

MONITOR HEATING SYSTEMS

Section 3: Operation

3-1 INTRODUCTION

Monitor is an easy-to-operate vented kerosene heater. Routine operation features high BTU output, automatic adjustment of room temperature, low fuel and power consumption, and choice of automatic or manual heater operation.

This section provides all information necessary to operate the Monitor Heating System. All operation procedures specified should be performed in the order in which they are described.

3-2 OPERATING SPECIFICATIONS

The following specifications apply to the operation of the Monitor 40 and the Monitor 21:

Monitor 40

- Rated Efficiency (as applied to kerosene heaters): 93%*
- Rated Efficiency (as applied to central heating systems): 87%
- Power Consumption : as follows

	HIGH	MEDIUM-HIGH	MEDIUM-LOW	LOW
IGNITION	BURN	BURN	BURN	BURN
	340watts	65watts 62watts	58watts	58watts

- Circulation Fan Output : 388 cubic feet/min.
- Fuel source : Remote, separate tank
- Potential heating area : 900-3200 sq. feet

*The energy from the combustion process is released in the form of heat and vaporized water. Normally, heating systems discharge water from combustion to the atmosphere without condensing it. This 93% efficiency rating means that, assuming the water cannot be condensed, 93% of the heat produced by the combustion process is recovered. Assuming the water can be condensed, the efficiency is 87%.

NOTE: Actual effective heating area depends upon numerous factors such as type and severity of climate, type of dwelling construction, condition of dwelling, and thickness and effectiveness of dwelling insulation.

Table 3-1 lists Monitor 40 performance specifications at various user-selected heat output settings.

Table 3-1 HEATER PERFORMANCE SPECIFICATIONS

Specification	Setting			
	Low	Medium Low	Medium High	High
Rating	16,200	21,000	33,900	43,000
Heater Output/hr.	15,000	19,500	31,500	40,000
Fuel Consumption (gal/hr)	0.12	0.16	0.25	0.319
8-hrs/day burntime (5-gal. tank)	5.2days	3.9days	2.5days	2.0days
Continuous-use burntime (5-gal.tank)	41.7hrs.	31.3hrs.	20hrs.	15.7hrs.
8-hrs/day burntime (55-gal.tank)	57.3days	43days	27.5days	21.6days
Continuous-use burntime (55-gal.tank)	19.1days	14.3days	9.2days	7.2days
8-hrs/day burntime (275-gal.tank)	286.5days	214.8days	137.5days	107.8days
Continuous-use burntime (275-gal.tank)	95.5days	71.6days	45.8days	35.9days

MONITOR HEATING SYSTEMS

Section 3: Operation

Monitor 21

- Rated Efficiency (as apply to kerosene heater): 93%*
- Rated Efficiency (as apply to central heating systems): 87%
- Power Consumption : as follows

	HIGH	MEDIUM-HIGH	MEDIUM-LOW	LOW
IGNITION	BURN	BURN	BURN	BURN
250watts	52watts	51watts	50watts	50watts

- Circulation Fan Output : 176 cubic feet/min
- Fuel source : 1.32 U.S. gal., separate tank optional
- Potential heating area : 600-2000 sq. feet

Table 3-2 lists Monitor 21 performance specifications at various user-selected heat output setting.

Table 3-2 HEATER PERFORMANCE SPECIFICATIONS

Specification	Setting			
	Low	Medium Low	Medium High	High
Rating	9,600	11,700	17,400	22,000
Heater Output/hr.	8,900	10,900	16,200	20,400
Fuel Consumption (gal/hr)	0.07	0.09	0.13	0.164
8-hrs/day burntime (1.32-gal. tank)	2.4days	1.8days	1.3days	1.0days
Continuous-use burntime (1.32-gal.tank)	18.9hrs.	14.7hrs.	10.2hrs.	8.0hrs.
8-hrs/day brntime (55-gal.tank)	98.2days	76.4days	52.9days	41.9days
Continuous-use burntime (55-gal.tank)	32.7days	25.5days	17.6days	14.0days

MONITOR HEATING SYSTEMS

Section 3: Operation

3-3 OPERATING CONTROLS AND INDICATORS

Several controls and indicators are used to operate the heater and to monitor its performance as follows:

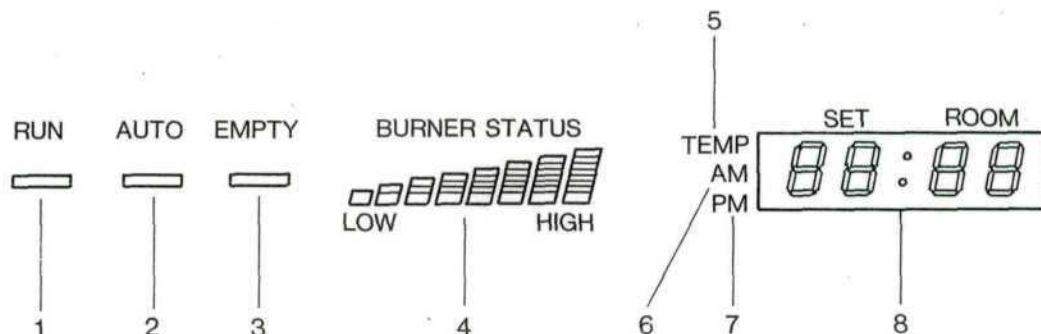


Figure 3-1, INDICATORS

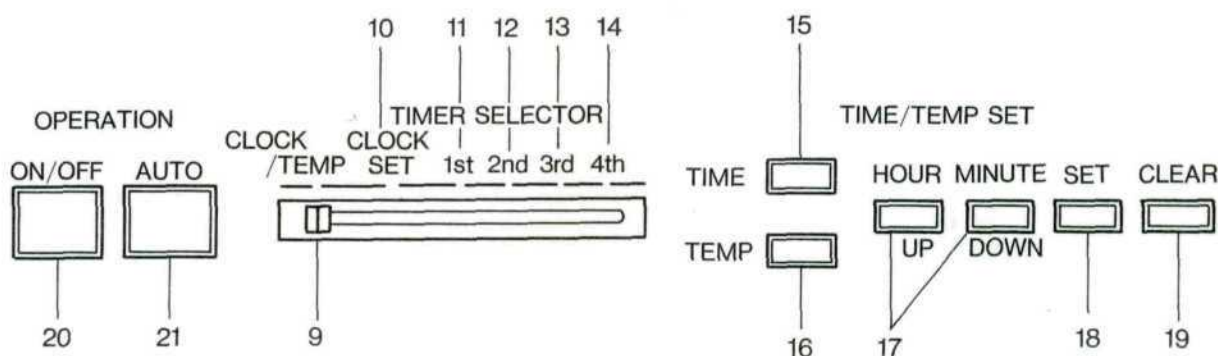


Figure 3-2, CONTROLS

FIGURE AND ITEM NO	CONTROL OR INDICATOR.	FUNCTION										
Figure 3-1, Item1	RUN Indicator Light	Light to indicate that power has been applied to heater. Illuminates when operation ON/OFF push-button switch is pressed to position ON										
Figure 3-1, Item2	AUTO Indicator Light	Lights when heater runs in automatic mode. AUTO, RUN, and appropriate BURNER STATUS Indicators are illuminated simultaneously if heater is burning.										
Figure 3-1, Item3	Empty Indicator Light	In case of using the cartridge tank, when the fuel is empty, EMPTY Indicator Light blinks. This Light is not provided with Monitor 40.										
Figure 3-1, Item4	BURNER STATUS Indicator Lights	Light in accordance with heat output as follows: <table><tr><td>Heat Output</td><td>Light Pattern</td></tr><tr><td>High</td><td>8indicators-ON</td></tr><tr><td>Medium High</td><td>6indicators-ON</td></tr><tr><td>Medium Low</td><td>4indicators-ON</td></tr><tr><td>Low</td><td>2indicators-ON</td></tr></table>	Heat Output	Light Pattern	High	8indicators-ON	Medium High	6indicators-ON	Medium Low	4indicators-ON	Low	2indicators-ON
Heat Output	Light Pattern											
High	8indicators-ON											
Medium High	6indicators-ON											
Medium Low	4indicators-ON											
Low	2indicators-ON											

MONITOR HEATING SYSTEMS

Section 3: Operation

FIGURE AND ITEM NO	CONTROL OR INDICATOR.	FUNCTION
Figure 3-1, Item5	TEMP Indicator Light	Lights when heater is running and Digital Window is showing the temperature.
Figure 3-1, Item6	AM Indicator Light	
Figure 3-1, Item7	PM Indicator Light	
Figure 3-1, Item8	Digital Display	Indicates SET and ROOM temperature when heater is running, and indicates time when heater is Off. Indicates time and temperature for automatic operation setting.
Figure 3-2, Item9	TIMER SELECTOR CLOCK/TEMP position	Displays set and current room temperature when heater is ON. Displays current time (after time has been programmed) when heater is OFF. Prior to programming, 88:88 is displayed on clock. NOTO: During routine heater operation, the selector switch is normally set to this position.
Figure 3-2, Item10	CLOCK SET position	Programs current time on Clock by use of HOUR and MINUTE push-button switches. NOTO: Prior to programming current time, Digital Display shows 88:88. IMPORTANT: Once current time has been programmed, press the SET pushbutton switch with in 60 seconds. Otherwise clock display will revert to previously programmed time, if any.
Figure 3-2, Item11	1ST Position	Programs first automatic heater operation. When programmed, heater automatically operates at specified time and temperature (i.e. 6:00 a.m., 70°F), if set for AUTO, providing that heater has been set for automatic mode of operation. TIME, TEMP, HOUR(UP), MINUTE(DOWN) and SET push-button switches are used to program first operated time and temperature. IMPORTANTO Once time and temperature have been programmed, the SET push-button switch must be pressed with in 15seconds. Otherwise, time and temperature will revert to previously programmed time, if any. When selector switch is set to this position, 1st presently programmed time and temperature are displayed.
Figure 3-2, Item12	2ND Position	Programs second automatic heater operation as same as 1st position.

MONITOR HEATING SYSTEMS

Section 3: Operation

FIGURE AND ITEM NO	CONTROL OR INDICATOR.	FUNCTION
Figure 3-2, Item13	3RD Position	Programs third automatic heater operation as same as 1st position.
Figure 3-2, Item14	4TH Position	Programs fourth automatic heater operation as same as 1st position.
Figure 3-2, Item15	TIME push-button switch	This switch is used to set time and change display over.
Figure 3-2, Item16	TEMP push-button switch	This switch is used set temperature and change display over.
Figure 3-2, Item17	HOUR/UP, MINUTE/DOWN repetitive-action push-button switch	Programs time or temperature. NOTE: Each time push-button switch is pressed, the digit advances in increments of one digit. If push-button is pressed and held, the digits are advanced repetitively.
Figure 3-2, Item18	SET push-button switch	"Sets" time and/or temperature. If this control is not pressed after time and/or temperature have been programmed, the time and/or temperature programmed (as indicated by display window) will not be accepted, and will revert to previously programmed time and/or temperature.
Figure 3-2, Item19	CLEAR push-button switch	Erases programmed time and temperature. When cleared, time and/or temperature previously programmed and displayed disappear(s) from window. IMPORTANT: Both current time and automatically programmed time(s), temperature(s) will have to be reprogrammed if electrical operation is interrupted by power failure or by disconnecting heater plug from wall outlet. If this occurs, the heater will go into MANUAL mode of operation and maintain initial set temperature(72°F).
Figure 3-2, Item20	ON/OFF push-button switch	ON position (push-button is "in") applies power to the unit. When this occurs, the RUN indicator lights to indicate that heater operation has begun. OFF position (push-button is "out") remove power from the heater. All circuits-except for Clock and Air Flow — are shut down.

MONITOR HEATING SYSTEMS

Section 3: Operation

FIGURE AND ITEM NO	CONTROL OR INDICATOR	FUNCTION
Figure 3-2, Item 21	AUTO push-button switch	<p>Places heater in automatic mode of operation. AUTO indicator lights to confirm automatic operation.</p> <p>Assuming that the heater has been properly programmed, heater will operate automatically.</p> <p>When pressed again, AUTO indicator goes out and then heater will operate in MANUAL mode. During manual operation, the user turns heater ON and OFF, at will.</p>

3-4 PRE-OPERATION CHECK LIST

After heater installation, but prior to Monitor heater start-up, inspect the system for operational readiness. The following check list specifies those items that should be inspected on a routine basis:

- ✓ Check that the Monitor heater is plugged into wall outlet (120 Vac, 60 Hz)
- ✓ Verify that adequate supply of kerosene is available in fuel tank
- ✓ Confirm that fuel is free of water or other contaminants
- ✓ Check fuel tank for good operating condition; it must be free of rust, corrosion, and/or leaks
- ✓ Inspect Fuel Line for signs of leaks, loose connections, cracks, air pockets or blockages
- ✓ Confirm that Fuel Valves on Fuel Tank and Fusible Link Valve are open so fuel can flow freely
- ✓ Outside dwelling, check area immediately around Flue Pipe for combustibles or obstructions to free air circulation
- ✓ Inspect Air Line for cracks, loose connections or blockage
- ✓ Check Exhaust Line for cracks, loose connections or blockage
- ✓ At rear of heater, verify that air flow to the Air Circulation Fan is not blocked
- ✓ Inspect dwelling interior and confirm that immediate area near heater is free of combustible and objects that might interfere with free air flow.
- ✓ Make certain that Heat Sensor is not exposed to drafts, direct sunlight, nor direct heat from the Monitor.
- ✓ Confirm that heater is level

If this inspection reveals any system deficiencies, correct the problems before operating the heater.

3-5 OPERATION

Operation of Monitor heater can be controlled manually by the user, or run automatically by the microprocessor.

Paragraphs 3-6 through 3-10 provide the details of heater start-up, operation, and shutdown. The controls and indicators illustrated by Figure 3-1 and 3-2 are used to operate the system and to monitor the heater's performance.

3-6 MANUAL HEATER OPERATION

Operation of the heater is under the direct control of the user (heater will not operate automatically). The heater will, however, automatically respond to changes in room temperature signaled by the Heat Sensor to maintain the temperature of the room at a comfortable level.

NOTE: Resetting the Fuel Constant Level Valve is necessary only if the heater is being started for the first time, hasn't been used for an extended period of time, or if tank has run empty. If priming is unnecessary skip to step 2.

STEP1: Prime the Heater

Gently press and release the Fuel Constant Level Valve Reset Lever four or five times.

STEP2: Select Manual Operation

If heater operation is in AUTO mode, press the AUTO push-button switch and change Auto to Manual mode.

STEP3: Select Temperature Setting

Press the TEMP push-button switch and press either the UP or DOWN push-button switch to set the digital set room temperature indicator to the desired temperature, and then press the SET push-button switch.

MONITOR HEATING SYSTEMS

Section 3: Operation

IMPORTANT: In case no temperature is set, temperature will automatically be set at 72°F by microprocessor.

STEP4: Turn Monitor On

Press the ON/OFF push button switch to position ON. The RUN indicator light illuminates to indicate that power has been applied to the instrument and the heater is cycled for manual mode of operation.

3-7 AUTOMATIC HEATER OPERATION

Automatic operation is established by programming the time/temperature settings for specific times. On a daily basis, a maximum of four time/temperature settings can be programmed.

If, subsequently, it should be desired to switch to manual mode of operation, the changeover can be made at any time.

Proceed with automatic mode of operation in the following manner:

STEP1: Program Clock for Current Time

- Position TIMER SELECTOR slide switch at position CLOCK SET.
- Press HOUR push-button switch to program current hour on the Clock.

IMPORTANT: Be sure to clock for AM or PM, as appropriate.

NOTE: Both hour and minute digits on Display Window are advanced in increments of one by pressing the appropriate push-button switch one time for each digit; digits can also be advanced repetitively by pressing and holding the appropriate push-button switch.

- Press MINUTE push-button switch to program the current minute(s) on Clock.
- Immediately after programming current time in terms of hours and minutes, press the SET push-button switch.
- Place TIMER SELECTOR slide switch in position CLOCK/TEMP and verify that time displayed on Clock is the current time.

STEP2: Program the 1st Time/Temperature

- Slide TIMER SELECTOR slide switch to position 1st.
- Press TIME push-button switch.
- Press HOUR and MINUTE push-button switches to program 1st desired time.

IMPORTANT: Be sure to set the clock AM or PM,

as appropriate.

- Immediately after programming the 1st desired time, press the SET push-button switch. This step must be completed within fifteen seconds after programming the time.
- Press TEMP push-button switch.
- Press UP and/or DOWN push-button switch(es) to program 1st desired temperature.
- Immediately after programming the 1st desired temperature, Press the SET push-button switch. This step must be completed within fifteen seconds after programming the temperature.

STEP3: Program the Remaining Times

With the TIMER SELECTOR slide switch in the appropriate positions, program the 2nd, 3rd, 4th times as described above.

Be sure to press the SET push-button switch after each time is programmed.

IMPORTANT: Should heater power be interrupted by a power failure or by disconnection of the power cord, heater reverts to MANUAL operation, and all AUTO programming is erased.

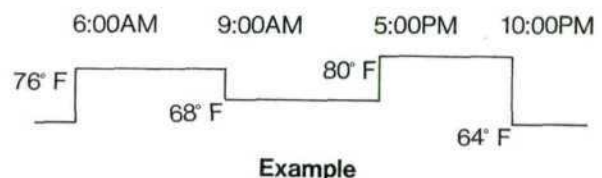
STEP4: Select Automatic Operation

Press AUTO push-button switch. The AUTO indicator light will illuminate.

STEP5: Turn Monitor ON

Press ON/OFF push-button switch to position ON. The RUN indicator light will illuminate to indicate that power has been applied to the heater.

From this point, heater operation is as follow example:



3-8 REPROGRAMMING THE MONITOR HEATER

On occasion, it may be necessary to reprogram the Monitor.

Reprogramming is performed as specified below:

MONITOR HEATING SYSTEMS

Section 3: Operation

STEP1: Reprogramming Current Time (if necessary)

- A. Set the TIMER SELECTOR slide switch to position CLOCK SET.
- B. Press HOUR and MINUTE push-button switches to program new current time. Set applicable time by watching Clock display.
- C. Press SET push-button switch.

IMPORTANT: If SET push-button switch is not pressed, current time will revert to previously programmed time.

STEP2: Reprogramming Automatic Operation

- A. Set TIMER SELECTOR switch to appropriate position (1st, 2nd, 3rd or 4th)
- B. Press TIME push-button switch.
- C. Press CLEAR push-button switch. Time displayed on window will disappear.
- D. Using HOUR and MINUTE push-button switches program new desired time by watching the Display Window.
- E. Press SET push-button switch.
- F. Press TEMP push-button switch.
- G. Press CLEAR push-button switch. Set Temperature displayed on Window will disappear.
- H. Using UP and DOWN push-button switches program new desired temperature by watching the Display Window.
- I. Press SET push-button switch.

3-9 HEAT SENSOR

Heat Sensor is located on the rear of the cabinet. It is recommended to leave the sensor in its original mounted position. However should relocation be necessary, choose a location for the sensor that is not in the path of direct sunlight, drafts or the flow of warm air from the heater. Loosen the screw and release the sensor from the rear of the cabinet. Fasten the sensor to the wall with the screw.

3-10 MONITOR SHUTDOWN

A simple one-step procedure is utilized to shutdown the Monitor:

Press ON/OFF push-button switch to position OFF; the RUN indicator will extinguish.

IMPORTANT: Once heater has shut down, it cannot be restarted until post-purge cycle has been completed. If ON/OFF switch is left in position ON, Monitor operation will automatically restart upon completion of post-purge.

3-11 OUT OF FUEL

During either manual or automatic operation of heater, fuel in the tank may be depleted.

The Monitor (in case of using external fuel tank) is known to be out of fuel when all of the following symptoms are present:

- Burner Status indicator lights blink.
- Absence of flame (visually verified through view plate on wall of Combustion Chamber).

STEP1: Turn Heater OFF

Press ON/OFF switch.

STEP2: Fill Fuel Tank

- A. Close shut-off valve at outlet of Fuel Tank.
- B. Drain Fuel Tank (from bottom, if possible) to remove all condensation, debris, and old fuel.
- C. Fill Fuel Tank with fresh, crystal clear kerosene.
- D. Upon completion of stepC, open shut-off valve which was closed in stepA above.

STEP3: Turn Heater ON

Press ON/OFF switch to ON. Proceed with normal heater operation.

The Monitor 21 (in case of using capsule fuel tank) is known to be out of fuel as follows:

When the EMPTY indicator light illuminates and flashes, a buzzer will sound for twenty seconds. The burner mode is changed to "Low" automatically, and then, the heater will shut off after 30 minutes.

The remaining burning time is indicated at the Display Window.

Refueling:

STEP1: Turn Heater OFF

Press ON/OFF switch and wait 15 minutes for the heater to cool.

STEP2: Lift Out the Capsule Fuel Tank

Open the tank cover and lift out the capsule fuel tank.

Turn the tank upside down, and remove the fuel cap.

STEP3: Fill the Capsule Fuel Tank

Fill the capsule fuel tank with fresh, crystal clear kerosene by using a siphon.

STEP4: Reinstall the Capsule Fuel Tank

Replace and tighten the fuel cap. To insure proper fuel flow, be sure the cap is secured correctly.

MONITOR HEATING SYSTEMS

Section 3: Operation

Install the tank with the arrow pointing forward, and close the tank cover.

STEP5: Turn Heater ON

Press ON/OFF switch to ON. Proceed with normal heater operation.

3-12 RECOVERY FROM A POWER FAILURE

The Monitor is equipped with an automatic reset feature which restores (the manual mode of) operation following interruption of power to the heater. Note, however, that a power-failure automatically triggers a cooling and purge cycle; routine operation will automatically be resumed following purge cycle.

A switch to manual mode is automatic because the absence of power to the microprocessor wipes-out the programmed memory.

To recover from a power failure (automatic mode of operation), proceed as listed below:

STEP1: Program Current Time

STEP2: Program Automatic Time/Temperature operation cycles.

STEP3: Return to Automatic operation.

3-13 RECOVERY FROM OVERHEAT CONDITION

The Monitor is protected against damage resulting from an overheat condition by two 110°C (Monitor 21), 115°C (Monitor 40) automatic reset thermostats.

In the event of an overheat the thermostats are triggered to cut off the flow of kerosene to the Burner Pot, the flame is extinguished automatically, and user is alerted to the overheat condition by blinking of the Burner Status indicators.

To recover from an overheat condition, proceed as outlined below:

STEP1: Turn OFF Heater

STEP2: Allow Monitor Heater to cool

NOTE: Be sure that heater is cool to touch.

A period of 30 to 45-minutes should be sufficient to permit heater to cool completely.

STEP3: Unplug Heater

Disconnect heater power cord from wall outlet.

STEP4: Check for Cause of Overheating

NOTE: Overheating is usually caused by objects

that impede free air circulation.

Look for debris and other obstructions at front of heater, at Circulation Fan at rear of the heater, and at Flue Pipe tip outside dwelling.

STEP5: Remove Louver Assembly

STEP6: Clean Heater Interior

WARNING:

BEFORE PROCEEDING TO CLEAN HEATER, BE SURE THAT HEATER INTERIOR IS COOL ENOUGH TO TOUCH.

With a clean, lint-free, damp rag or other appropriate cleaning material, wipe up all dust, dirt and debris from exterior of cabinet, including exterior of Combustion Chamber and Heat Exchanger.

STEP7: Replace Louver Assembly

STEP8: Reconnect Monitor Heater Power Plug to the Wall Outlet.

STEP9: Turn Heater ON

STEP10: Reprogram Heater Microprocessor

STEP11: Select Mode of Operation

CAUTION: If after the completion of recovery procedure, the heater overheats again, something is wrong!

Do not operate heater until problem has been diagnosed and corrected.

3-14 RECOVERY FROM BLOWN FUSE

All electrical components of the Monitor heater are protected against power overloads and electrical malfunctions by two 2-amp fuses and a 10-amp fuse. Should fuse blow, the recovery procedure is outlined below:

STEP1: Turn Monitor OFF

STEP2: Unplug heater

STEP3: Remove louver assembly

STEP4: Remove front cover

MONITOR HEATING SYSTEMS

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NOTE: As the Front Cover of the Monitor 40 is connected to the Printed Circuit Board by Lead Wires, pull the Front Cover to the front side slightly and remove the Connector of the Lead Wires from the Printed Circuit Board, and then, remove the Front Cover.

STEP5: Locate and replace fuse(s)

STEP6: Reattach front cover
(In case of the Monitor 40, be sure that the connector is connected to the printed circuit board.)

STEP7: Reattach louver assembly

STEP8: Plug heater power cord into wall outlet

STEP9: Turn Monitor ON

STEP10: Reprogram heater

STEP11: Program Automatic operation cycles (if applicable)

STEP12: Select Automatic operation (if applicable)

MONITOR HEATING SYSTEMS

Section 4: Maintenance

4-1 INTRODUCTION

Heater maintenance is divided into two classifications; periodic maintenance is required to maintain the heater in good operating condition; corrective maintenance is necessary to repair a malfunction.

4-2 PERIODIC MAINTENANCE

The Maintenance Schedule provided in Table 4-1 describes the tasks that must be performed periodically in order to sustain the efficiency of the Monitor Heating Systems.

At the time of the demonstration or installation, heater maintenance should be discussed with the user; emphasize that a clean heater and proper fuel are the keys to optimum heater operation and performance.

Table 4-1 SUGGESTED MAINTENANCE ACTIVITIES

Activity	Material	Remarks
Check all fuel lines for leaks and loose connections	3/8" OD copper tubing	Fuel lines must be secure and free of leaks. Replace tubing when necessary.
Inspect exhaust lines for leaks or loose connections		All exhaust lines must be covered by a cloth insulation cover.
Check fuel for water and/or other contamination. If the capsule tank is used on the Monitor 21 the capsule tank filter should be checked, cleaned or replaced.		Fuel color should be crystal clear. If fuel is contaminated, see Corrective Maintenance procedure, paragraph 4-9.
Inspect Fuel Pipe for obstruction		
Inspect electrical wiring for cracks, signs of deterioration, bare wires and/or loose connectors		WARNING: UNPLUG HEATER BEFORE PROCEEDING. HEATER MUST ALSO BE COOL BEFORE STATING.
Clean heater	Clean, lint-free cloth and a mild non-abrasive household cleaning agent. USE ONLY NON-PETROLEUM DISTILLATE CLEANERS.	Wipe down exterior of heater cabinet. Vacuum heater interior (if necessary).
Clean Air Circulation Fan (Monthly)		Vacuum fan cage. Wipe fan blades.
Inspect air lines for leaks or loose connections. Inspect rubber Air Hose at rear of heater.		Look for cracks, wear, or signs of deterioration; replace if necessary.
Clean fuel constant level Valve filter. Inspect fusible link Valve input fitting. Clean only if necessary, Verify that heater is level.	Clean Kerosene	Refer to paragraph 4-5. Procedure is described in paragraph 4-6. Check Leveling Guide.

MONITOR HEATING SYSTEMS

Section 4: Maintenance

Activity	Material	Remarks
Inspect Combustion Ring, Flame Sensor Rod and Baffle. (Suggested frequency every 3 years).		Clean all carbon deposits. Replace if excessively worn or cracked. NOTE: If any gaskets are torn when Components are removed, the gasket must be replaced.
Clean Combustion Chamber (every 3 years)		Vacuum all carbon deposits from interior of chamber.
Inspect air holes in Burner Pot		Use a small, stiff brush or a short length of soft copper wire to clean any blocked holes.
Clean Igniter		Scrape any carbon deposits from igniter.
Check air line that interconnect Combustion Blower and Air Pressure Switch.		Replace air line that is worn, broken or brittle.
Check for carbon build up in fuel inlet going into burn chamber (every year) CAUTION: If any obstruction is felt remove igniter before proceeding.		Disconnect copper fuel line from burn chamber and clear fuel inlet line by reaming with a phillips head screw driver which should be able to go in approximately "without obstruction.

4-3 INSPECT EXHAUST/AIR LINES

Verify that all exhaust and air lines are free of leaks and loose connections, as specified below:

STEP1: Remove Protective Cloth

Remove cloth insulation cover(s) from all exhaust lines.

STEP2: Inspection of Exhaust/Air Lines

- Visually inspect both air and exhaust lines for obvious cracks, leaks or loose connections. Black carbon deposits may be evidence of these leaks.
- Be sure that all lines are installed tightly and securely, especially at joints.
- Turn heater ON.
- Carefully apply a small amount of soapy water (with a paint brush) to the surface areas of the air/exhaust lines.

Any leaks that may exist will be readily identified by the appearance of bubbles.

STEP3: Return to Operating Condition

- Turn heater OFF.

- Dry all lines with paper towels.
- Repair any leaks that have been found (if necessary, replace the tubing).
- Replace cloth insulation covers.

4-4 VERIFY IGNITER OPERATION

Visually inspect Igniter Operation

WARNING:

HEATER IS OPERATIONAL DURING THIS INSPECTION. AVOID DIRECT CONTACT WITH ANY HEATED OR ELECTRICAL COMPONENT.

STEP1: Prepare for Inspection

Remove Louver Assembly.

STEP2: Visual Inspection

- Turn heater ON.
- Look (downward) through window on the Combustion Chamber. Verify that igniter is glowing.
If igniter does not glow, something is wrong. Refer to the Troubleshooting Chart in Section 6 of this Service Manual to diagnose the problem.

MONITOR HEATING SYSTEMS

Section 4: Maintenance

STEP3: Reassembly of Heater

Turn the heater OFF and replace the Louver Assembly.

4-5 CLEAN FUEL CONSTANT LEVEL VALVE FILTER

Contaminants are trapped by the filter to prevent them from clogging the Fuel Constant Level Valve.

The filter, itself has a great number of small pores. Whenever a filter is torn or disfigured (enlarged pores), it should immediately be replaced.

Inspect and clean the filter as indicated by the procedure below:

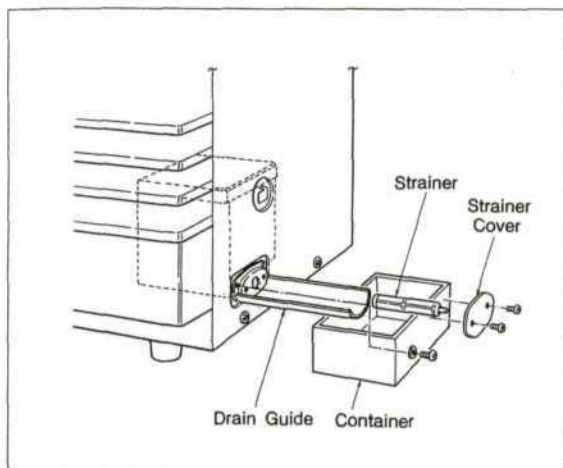
WARNING

CLOSE FUSIBLE LINK VALVE ON M-21 OR CLOSE SHUT-OFF VALVE OF THE EXTERNAL FUEL TANK ON M-40 TO AVOID DRAINING ALL FUEL FROM TANKS.

NOTE: Power should be OFF during the performance of this procedure.

STEP1: Disassembly

- A. Using a phillips head screwdriver, unscrew the screws holding the rounded diamond-shaped cover plate at the bottom of the Fuel Constant Level Valve. Remove the cover plate.



M-40

NOTE: Position a six inch U shaped piece of metal or cardboard under strainer cover to drain fuel into a pan.

- B. Carefully remove the rubber gasket which is located behind the cover plate.

STEP2: Inspection and Cleaning

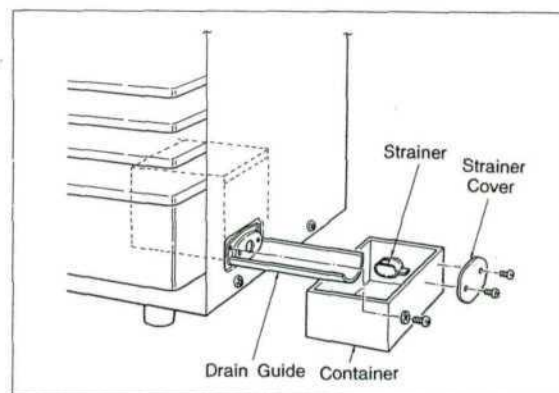
- A. Pull the filter straight out of the fuel reservoir.
B. If the filter is dirty (but undamaged), rinse the filter in fresh, clean kerosene to remove all particles. Replace damaged filters.
C. To drain off upper portion of fuel constant level valve, back out phillips head screw which is located slightly above and to the left of filter cover plate. (See Fig4-1)

STEP3: Reassembly

- A. Push the (new or cleaned) filter back into the bottom of the fuel reservoir.
B. Replace both the rubber gasket and the cover plate. (Take care to properly align the screw holes in the gasket and cover plate).
C. Wipe up any spilled fuel.

4-6 CLEANING FUSIBLE LINK VALVE INTAKE FITTING ON M-21

At periodic intervals, the fitting on the Fusible Link Valve should be cleaned to prevent any accumulation of foreign materials from clogging the inlet. This is accomplished as follows:



M-21

Figure 4-1 CLEAN FUEL CONSTANT LEVEL VALVE

MONITOR HEATING SYSTEMS

Section 4: Maintenance

WARNING

UNPLUG THE HEATER. POWER TO THE HEATER SHOULD BE OFF DURING THE PERFORMANCE OF THIS PROCEDURE.

STEP1: Close off Fuel Supply

- A. Shut off fuel at the Storage Tank or remove fuel from the fuel sump tank with siphon and syringe if using the capsule fuel tank.
- B. Manually turn handle to close Fusible Link Valve.

NOTE: Place paper towels underneath the Fusible Link Valve to catch any spilled fuel.

STEP2: Clean Valve

- A. Loosen hex nut on Fusible Link Valve inlet fitting at rear of the heater. Disconnect the copper tubing which delivers the fuel from the storage or the fuel sump tank.
- B. Using a small, straight piece of wire carefully and slowly ream-out the inlet fitting on the Fusible Link Valve.

Avoid scratching the inside wall of the fitting.

With a cotton swab, wipe the interior area of the inlet fitting.

STEP3: Reconnect Fuel Line

- A. Reconnect the copper tubing to the intake fitting and tighten the hex nut.
- B. Turn ON fuel at Fusible Link Valve and at storage tank or fuel sump tank.
- C. Check for leaks.

4-7 CORRECTIVE MAINTENANCE

The two procedures below are remedies for very generalized types of operating difficulties.

4-8 REPLACEMENT OF FUSES

A short circuit or similar electrical malfunction could cause the fuse to blow. Troubleshoot the cause of the blown fuse.

Replace the fuse as follows:

WARNING

DO NOT REPLACE FUSE WHILE POWER IS ON.

STEP1: Removal of Fuse

- A. Unplug heater. Remove Louver Assembly and Front Cover.

- B. Remove the fuse from fuseholder on the Printed Circuit Board.

STEP2: Installation of New Fuse

- A. Install a new fuse into the fuseholder. The fuse must be a 250-V, 2 amp or a 250-V, 10 amp type as marked on the printed circuit board.
- B. Replace the Front Cover and the Louver Assembly and plug the heater into the wall outlet.

IMPORTANT: Whenever the heater is unplugged, the Microprocessor must be reprogrammed when power is restored.

4-9 FUEL CONTAMINATION

Fuel contamination is often difficult to diagnose, even though it will adversely affect heater operation and performance. The best course of action to take when fuel contamination is suspected is to examine all of the system's fuel filters, beginning with the fuel storage tank. If a Monitor Kerosene Lifter is part of the fueling system, examine and clean that unit's filter, as well as the filter located in the Fuel Constant Level Valve. When it has been determined that water or some other contaminants have infiltrated the fuel, the following action must be taken:

WARNING

BEFORE PROCEEDING FURTHER, UNPLUG THE HEATER.

STEP1: Remove Contamination

- A. Shut OFF the fuel supply at the storage tank or at the Fusible Link Valve.
- B. Drain off the contaminants from the fuel storage tank or the fuel sump tank (M-21). Fill with fresh, clean fuel.

STEP2: Clean the Heater

- A. Clean fuel constant level valve filter and filter compartment.
- B. Remove the Louver Assembly and Solenoid Pump on the constant level valve. Clean the Solenoid Pump filter.
- C. On the Monitor 21, remove the Front Cover, Top Cover, Front Bracket, Top Bracket, Combustion Chamber Cap, Baffle, Service Panel and the Flame Sensor, and then, remove the Burner Cap and Combustion Ring from the Burner Pot.

On the Monitor 40, remove the Front Cover, Top

MONITOR HEATING SYSTEMS

Section 4: Maintenance

Cover, Front Bracket, Service Panel and the Flame Sensor, and then, remove the Burner Cap and the Combustion Ring from the Burner Pot.

- D. Using clean paper towels, thoroughly wipe the bottom of the Burner Pot, the Burner Cap, the Combustion Ring, and the Flame Sensor Rod.

STEP3: Reinstall Cleaned Components

- A. Replace the components correctly and install new gasket.
- B. Turn on the fuel at the storage tank and at the fusible link valve, replace all covers and apply

power to the heater.

If problem still exists and contaminated fuel is suspected it can be checked by

- A. Shut off the fuel supply at the storage tank and at the fusible link valve.
- B. Drain off fuel control valve.
- C. Disconnect fuel line at back of heater and hook up a 5 gallon quick tank with proven good fuel.
- D. Test run heater to see if problem clears up with use of new fuel.

MONITOR HEATING SYSTEMS

Section 5: Servicing

5-1 INTRODUCTION

Servicing is required when the Monitor Heater is not running at proper efficiency. This section covers possible causes and corrective procedures for efficiency losses.

Signs of improper heater efficiency and performance would be:

- Yellowish lazy flame
- Smoke from flue pipe exhaust
- Heavy soot and carbon build up in combustion chamber
- Lowered heat output.

5-2 MEASUREMENT OF FUEL FLOW RATE

Fuel flow rates are preset and sealed. These rates should not and we recommend they do not be readjusted.

5-3 REMOVAL OF WATER DEPOSITS AND CONTAMINANTS FROM FUEL CONSTANT LEVEL VALVE AND FUEL LINES

NOTE: Disconnect the Monitor from power supply (unplug) before proceeding.

1. Use a syphon pump and a syringe to drain off any fuel in the fuel sump (in case of capsule tank use on the Monitor 21).
2. If using separate tank on the Monitor 21, shut off fusible link valve. On the Monitor 40 shut off valve of separate tank.
3. Bend a piece of sheet metal or cardboard into a U shape and place it under the fuel constant level valve strainer cover to drain bad fuel into a 1-2 liter pan. (Figure 4-1)
 - A. Remove strainer cover and drain.
 - B. With strainer cover removed, inspect, clean and/or replace strainer if damaged.
 - C. Remove drain port screw and drain.
 - D. Replace strainer, cover and screw.
 - E. Open fusible link valve or shut-off valve to refill system with fresh crystal clear kerosene.
 - F. Repeat steps 1-3 until all contaminated fuel is drained off.
4. Remove fuel feed pipe from burner pot and solenoid pump, and drain fuel into pan.
5. Once lines are clear, reconnect fuel feed pipe, turn operation switch ON and start a test run.

5-4 CLEANING THE BURN CHAMBER

Under normal running conditions, soot will not deposit in great quantities in side the burner, and a light covering of soot will not affect the performance

of the unit thus it need not be cleaned. However, if heavy soot built up does occur the unit should be opened and cleaned.

The burner is assembled using gaskets to maintain its air tightness. If these gaskets leak, the extra air can cause a serious soot problem and or exhaust gases to escape into the area being heated.

NOTE: When cleaning the burner it is recommended to replace the gaskets.

If cleaning is necessary, use the following method:

1. On the Monitor 21
 - A. Remove louver assembly.
 - B. Remove front cover.
 - C. Remove top cover and lead wire connectors.
 - D. Remove front bracket and top bracket to cover combustion chamber.
 - E. Remove combustion chamber cap.
 - F. Remove service panel.
 - G. Remove baffle from within combustion chamber.
 - H. Remove flame sensor.
2. On the Monitor 40
 - A. Remove louver assembly.
 - B. Remove front cover and lead wire connectors.
 - C. Remove top cover.
 - D. Remove front bracket to cover combustion chamber.
 - E. Remove service panel.
 - F. Remove Flame sensor.
3. Remove burner cap.
4. Turn counter-clockwise to remove combustion ring.
5. Use wire brush to clean inside of combustion chamber.
Vacuum and wipe clean with a waste cloth.

NOTE: Make sure all air inlet openings are clear.

6. If burner cloth on the bottom of burner is deformed, replace it.
7. Combustion ring may deform and deteriorate after several years use and should be cleaned and inspected before reinstallation. If combustion ring is warped, has cracked or is deteriorating it should be replaced.
8. When reassembling the unit check that combustion ring is positioned with the correct side up and is sitting squarely on all three support screws inside the combustion chamber.
9. Reinstall burner cap and flame sensor to correct position.

MONITOR HEATING SYSTEMS

Section 5: Servicing

5-5 CLEANING THE FUEL INLET

When cleaning soot from combustion chamber the fuel inlet pipe should also be cleaned. This can be done as follows:

1. Disconnect copper fuel line at burn chamber.
2. Push a phillips head screw driver (about the same size as the I.D. of fuel inlet pipe) into the fuel inlet pipe.
3. If obstruction is felt twist screw driver back and forth (to brake up soot and carbon) so that screwdriver ultimately penetrates to approx. 1".

MONITOR HEATING SYSTEMS

Section 6: Troubleshooting

MONITOR HEATING SYSTEMS

Section 6: Troubleshooting

Monitor 21/40 Resistance values

COMPONENT	APPROX. OHMS	
	M-21	M-40
Igniter (connector B/B)	16.8	12.7
Power Transformer—Primary (connector H/H)	97	97
Power Transformer—Secondary (connector L/L)	824	824
Power Transformer—Secondary (connector M/M)	1.3	1.3
Damper Solenoid (connector I/I)	4,600	4,600
Resistor (connector G/G)	68	91
Circulation Fan (M-40:WH & BK, M-21:RD & BK)	310	120
Circulation Fan (M-40:WH & GR, M-21:RD & YL)	365	190
Circulation Fan (M-40:BL & BK, M-21:GR & BK)	270	260
Circulation Fan (M-40:BL & GR, M-21:GR & YL)	210	200
Combustion Blower (M-40:WH & GR, M-21:BK & BK)	22	78
Combustion Blower (M-40:GR & OR)	—	92
Thermistor (connector Q/Q, at 77° F)	10,000	10,000
Fuse 2A (read with fuse out)	0.1	0.1
Fuse 10A (read with fuse out)	0.01	0.01
Solenoid Pump (coil)	688	695

WARNING:

**DISCONNECT HEATER FROM POWER SOURCE
BEFORE MAKING ANY RESISTANCE TESTS.**

MONITOR HEATING SYSTEMS

Section 6: Troubleshooting

Monitor 21/40 Component Voltage Readings

COMPONENT	READING TAKEN AT	AC	DC
Thermistor	Q on PCB Sensor disconnected		5
Thermistor	Q on PCB Sensor connected		1.6-3.3
Air Pressure Switch/ Overheat Protector Closed	Connector J	110	
Air Pressure Switch/ Overheat Protector Open	Connector J	0	
Damper Solenoid	I on PCB		105
Solenoid Pump	K on PCB		105
Circulation Fan High Speed	GR to BK BK to RD (M-21) BL to BK BK to WH (M-40)	110 110	
Circulation Fan Low Speed	YL to RD GR to YL (M-21) GR to WH BL to GR (M-40)	110 110	
Igniter	B on PCB	110	
Power Transformer (primary side)	H on PCB	110	
Power Transformer (secondary side)	Connector L Connector M	120	11
Combustion Blower High Speed	F on PCB	110	
Combustion Blower Low Speed	F on PCB (RL3 is OFF)	92(M-21) 88(M-40)	
Resistor	G on PCB	18(M-21) 22(M-40)	

MONITOR HEATING SYSTEMS

Section 6: Troubleshooting

TEST POINT VOLTAGE

Operation Mode	Preparation	Pre-purge Pre-heat	Igniting 1 high 5sec	Igniting 2 low med 55sec	Pre-burning 1 1.5 min. (C.F.M:Off)	Pre-burning 2 1.5 min. (C.F.M:Low)
TP 3	12V \pm 30%	12V \pm 30%	12V \pm 30%	12V \pm 30%	12V \pm 30%	12V \pm 30%
TP 4	5V \pm 10%	5V \pm 10%	5V \pm 10%	5V \pm 10%	5V \pm 10%	5V \pm 10%
TP 5	3.9V	3.9V	3.9V	3.9V	3.9V	3.9V
TP 6	pulse	pulse	pulse	pulse	pulse	pulse
TP 7	OV	OV	infinitely variable	infinitely variable	1.2V min.	1.2V min.
TP 8	pulse at plugin	5V	5V	5V	5V	5V

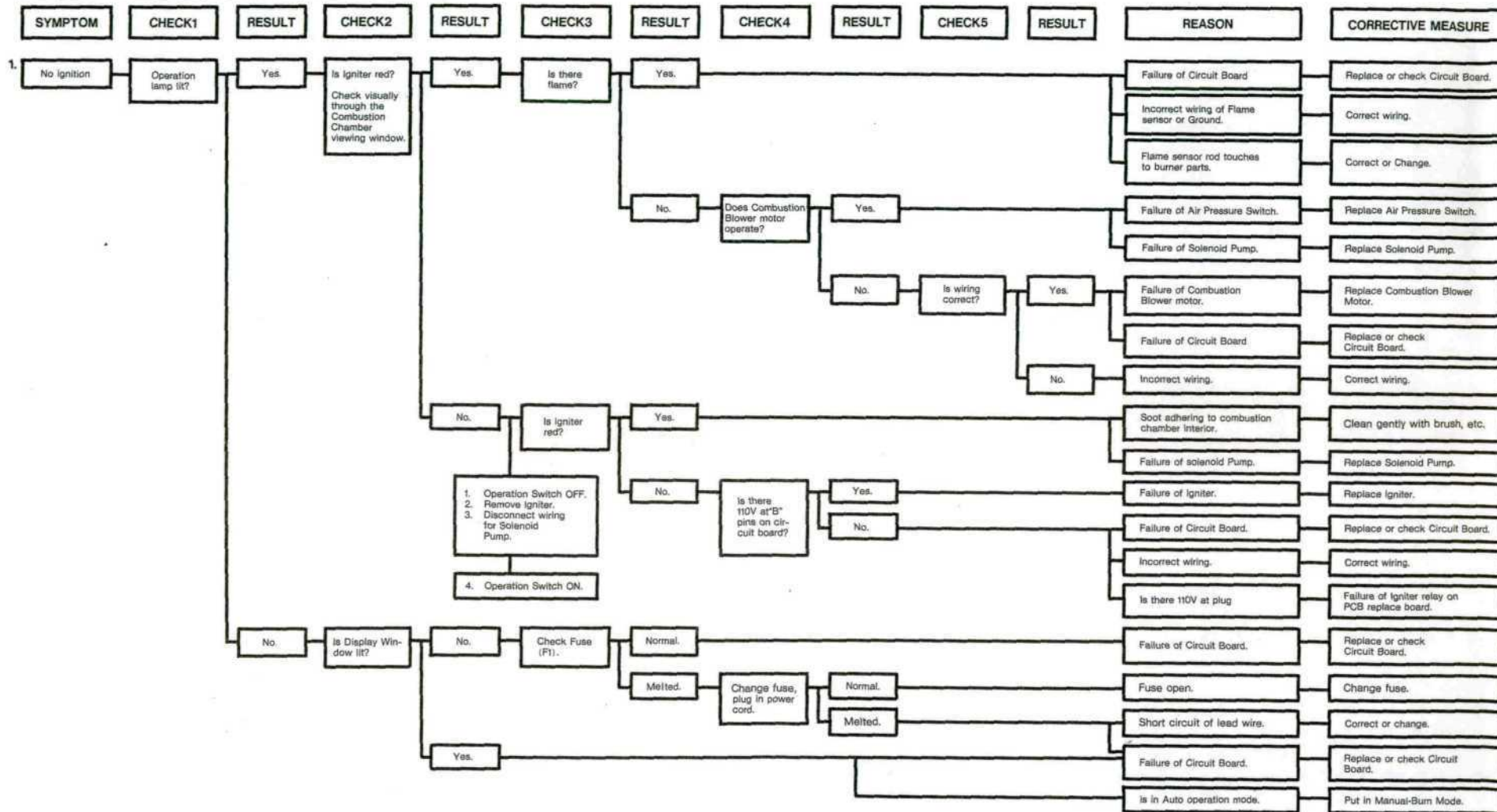
Operation Mode	High	Medium-High	Medium-Low	Low	OFF	Post-purge	Waiting until programmed time comes on
TP 3	12V \pm 30%	12V \pm 30%	12V \pm 30%	12V \pm 30%	12V \pm 30%	12V \pm 30%	12V \pm 30%
TP 4	5V \pm 10%	5V \pm 10%	5V \pm 10%	5V \pm 10%	5V \pm 10%	5V \pm 10%	5V \pm 10%
TP 5	3.9V	3.9V	3.9V	3.9V	3.9V	3.9V	3.9V
TP 6	pulse	pulse	pulse	pulse	pulse	pulse	pulse
TP 7	1.2V min.	1.2V min.	1.2V min.	1.2V min.	OV	infinitely variable	OV
TP 8	5V	5V	5V	5V	5V	5V	5V

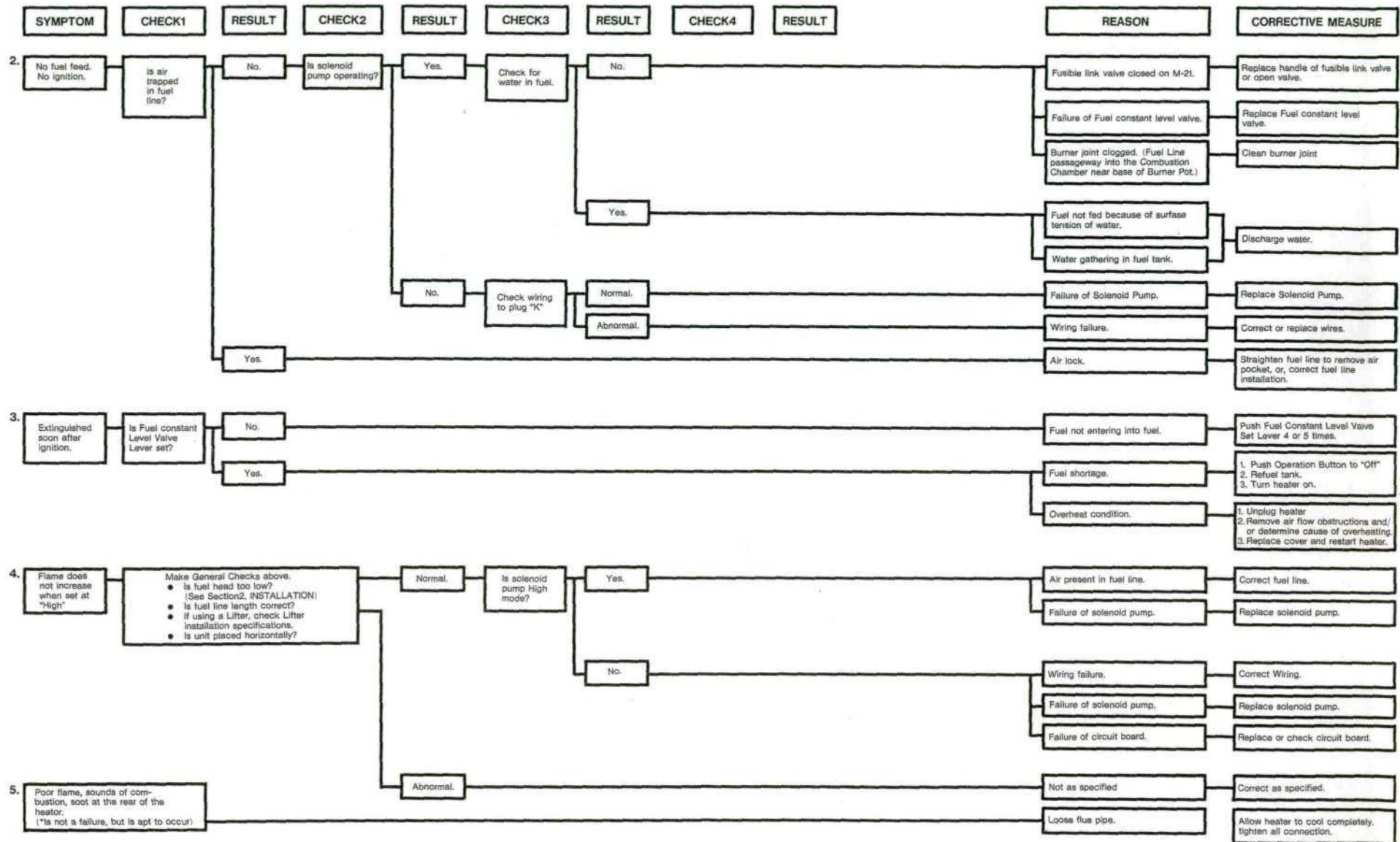
MONITOR HEATING SYSTEMS

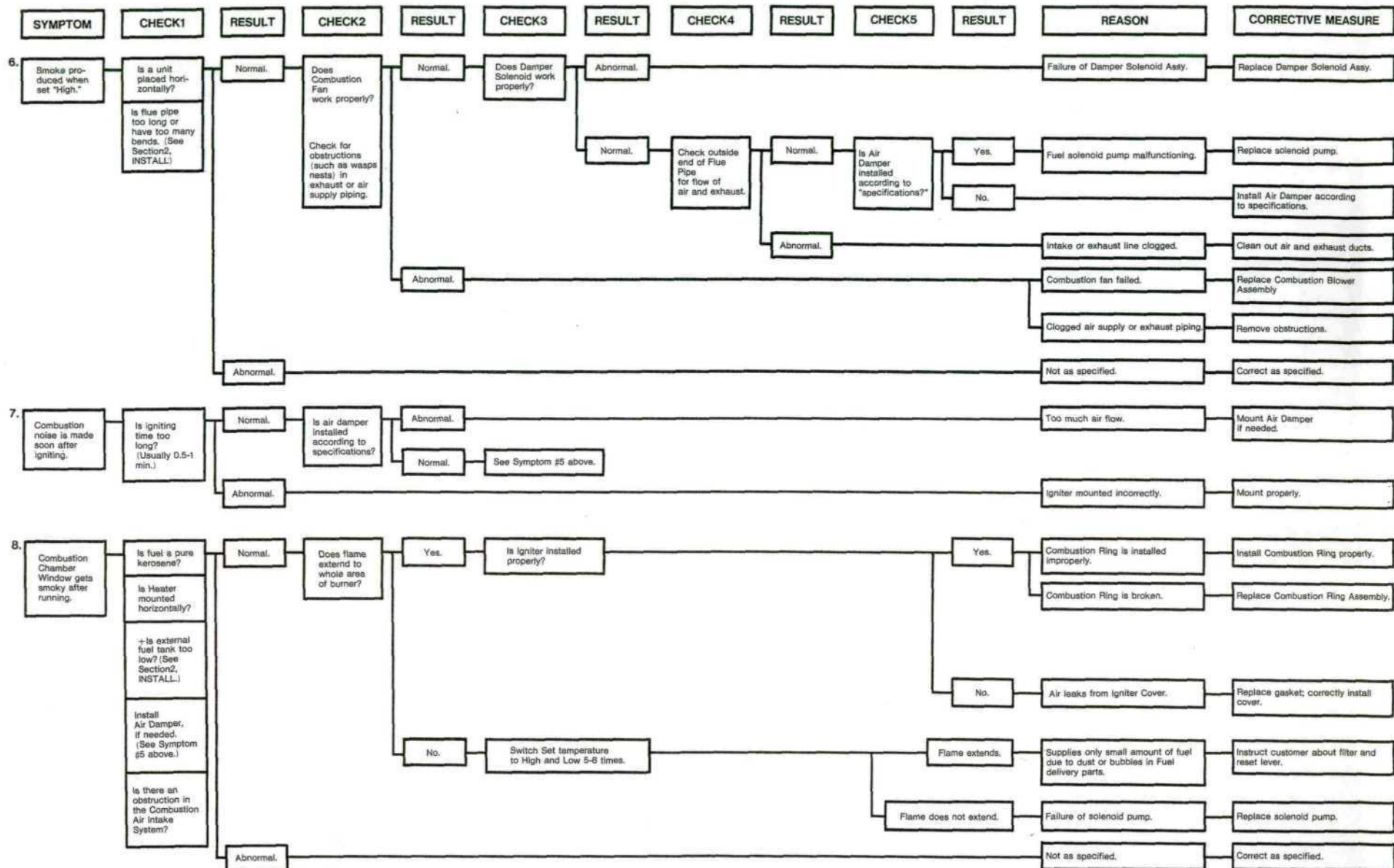
Section 6: Troubleshooting

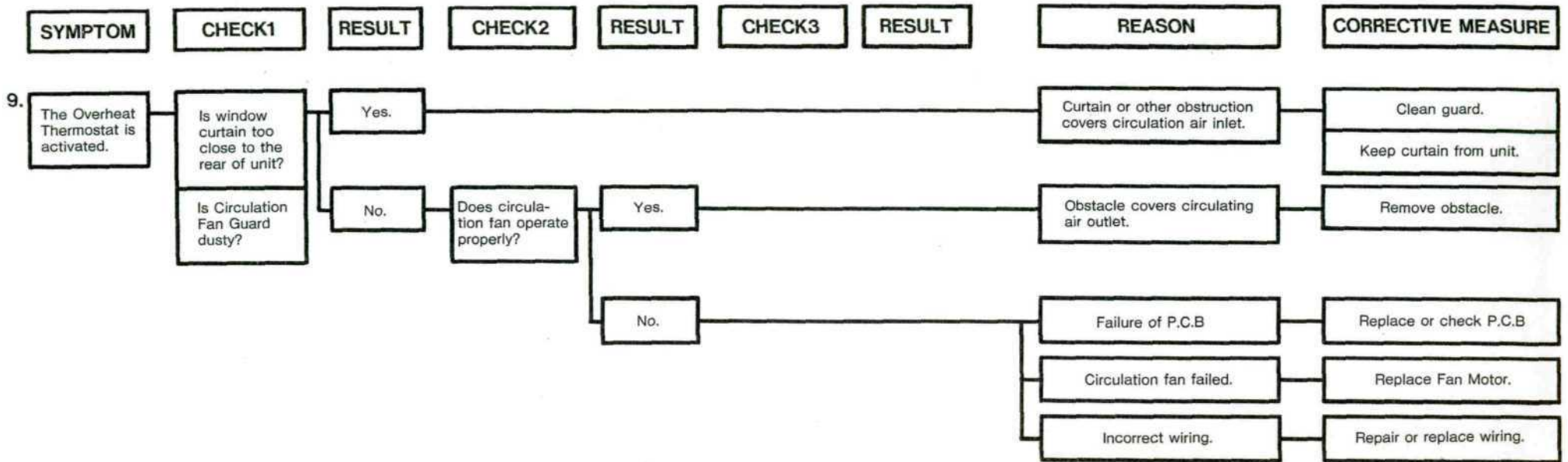
GENERAL CHECKS

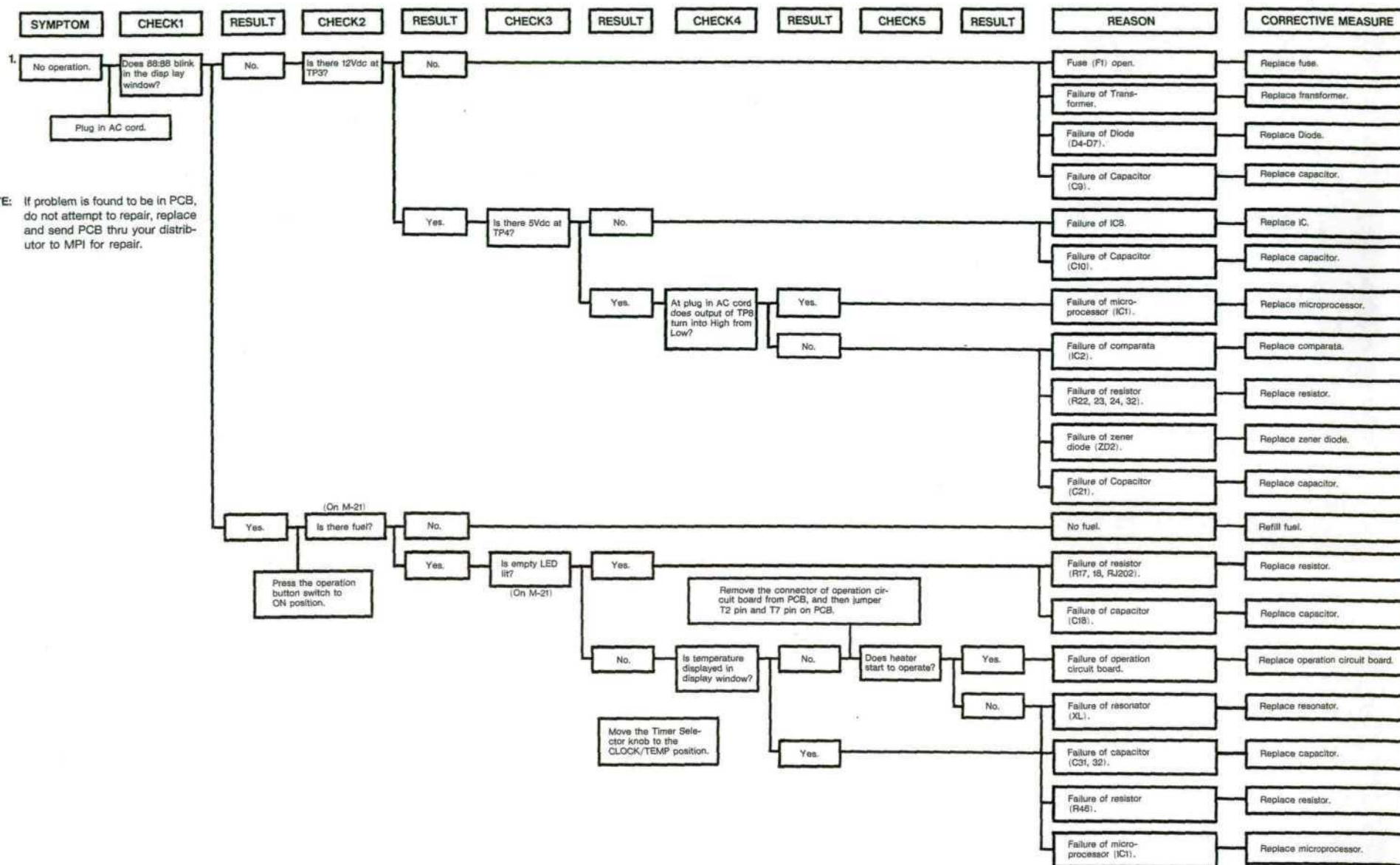
Is power available in wall outlet?
Is power Plug inserted in wall outlet?
Has there been a power interruption? (Display window shows 88:88)
Has Circulation Fan stopped?
Is fuel in tank? Tank valve open?
Has Fuel Constant Level Valve Set Lever raised and lowered?
Is Operation Switch on?
Is operation mode on Manual?
Is set temperature in High position?
Is Fusible Link Valve "open"?



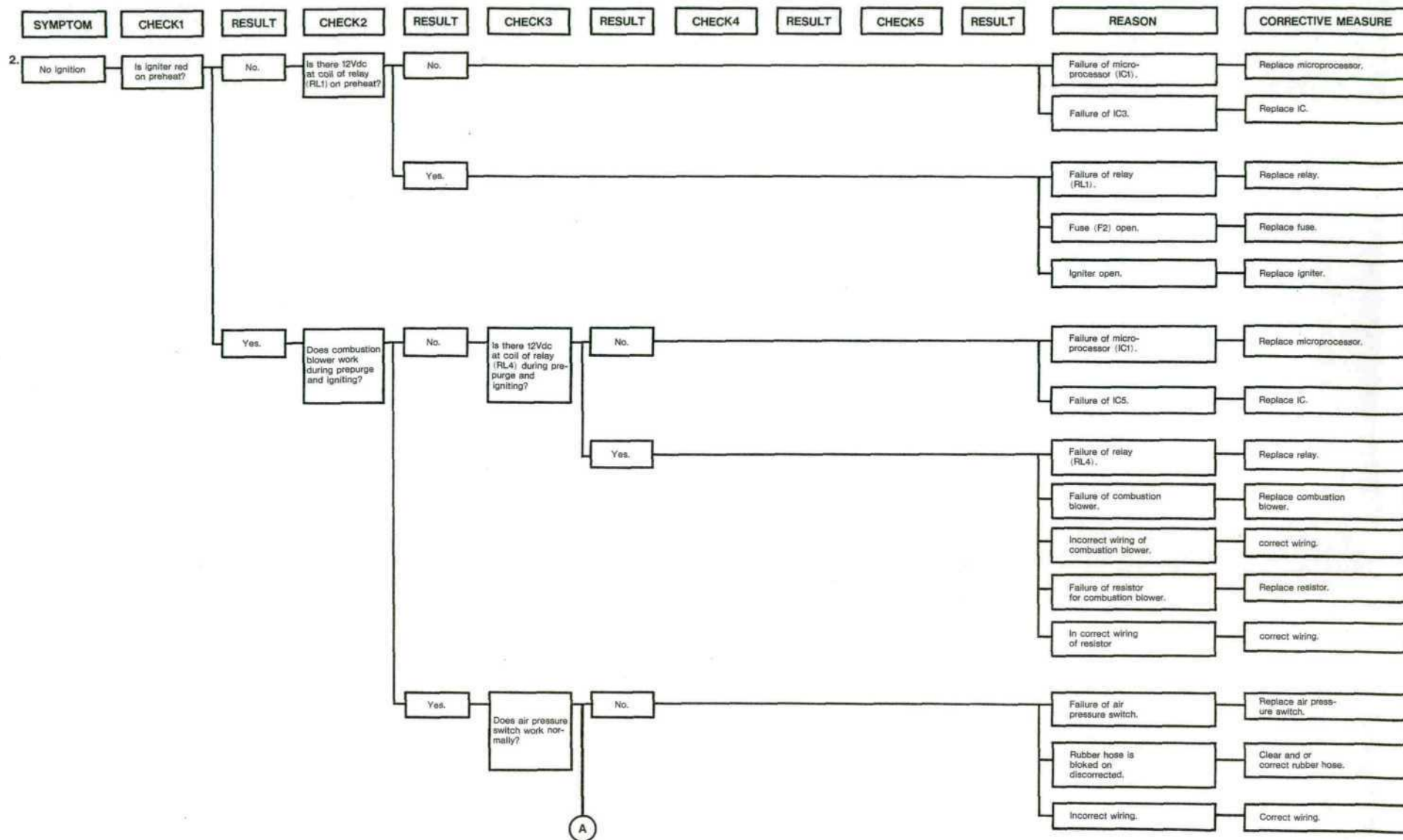




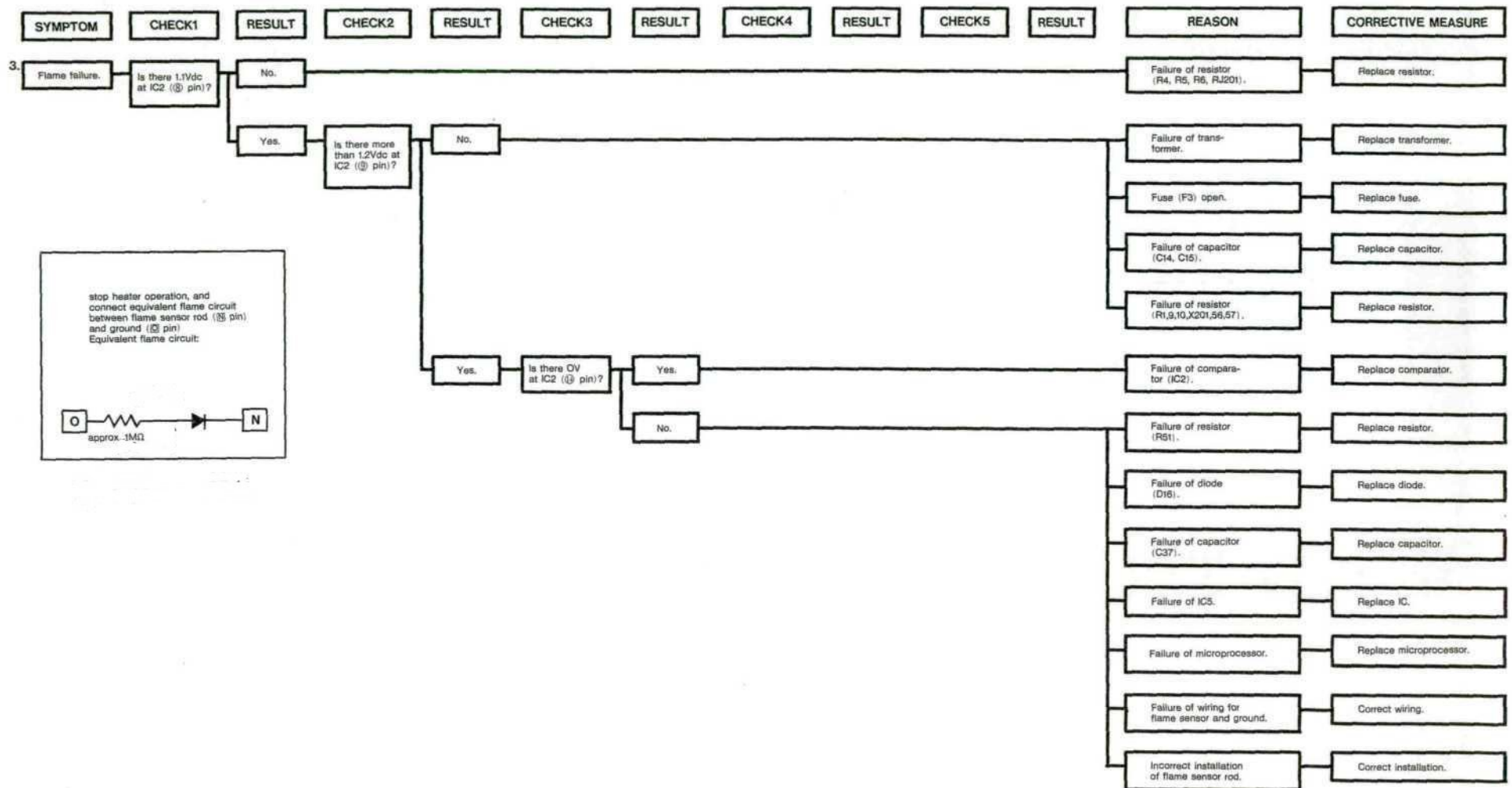


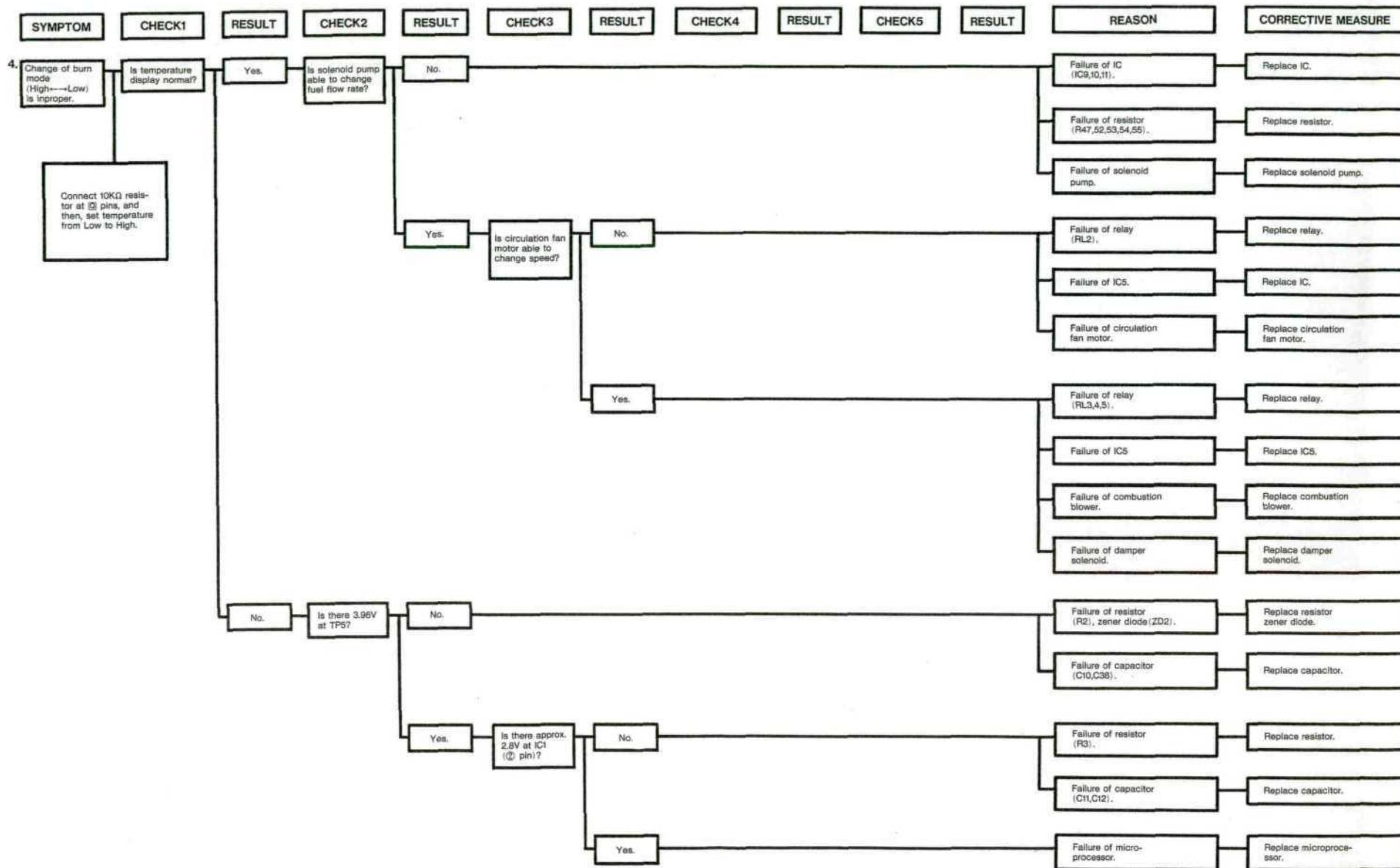


NOTE: If problem is found to be in PCB, do not attempt to repair, replace and send PCB thru your distributor to MPI for repair.



SYMPTOM	CHECK1	RESULT	CHECK2	RESULT	CHECK3	RESULT	CHECK4	RESULT	CHECK5	RESULT	REASON	CORRECTIVE MEASURE
						A						
						Yes.	Is there 12Vdc at coil of relay (RL6) during igniting?					
							Yes.	Does solenoid pump work during igniting?	No.		Failure of relay (RL6).	Replace relay.
											Failure of diode (D2).	Replace diode.
											Failure of solenoid pump.	Replace solenoid pump.
									Yes.		Failure of fuel supply parts.	Check fuel supply parts.
							No.	Is transistor (Q1) ON during igniting?	Yes.		Failure of micro-processor (IC1).	Replace microprocessor.
											Failure of IC8.	Replace IC.
											Failure of diode (D13).	Replace diode.
									No.		Failure of IC7.	Replace IC.
											Failure of IC (IC6, IC3).	Replace IC.
											Failure of resistor (R4B).	Replace resistor.
											Failure of transistor (Q1).	Replace transistor.
											Failure of diode (D1).	Replace diode.





MONITOR HEATING SYSTEM

Section 7: Electrical System

Printed Circuit Wiring Diagram

CONNECTION OF LEAD WIRES

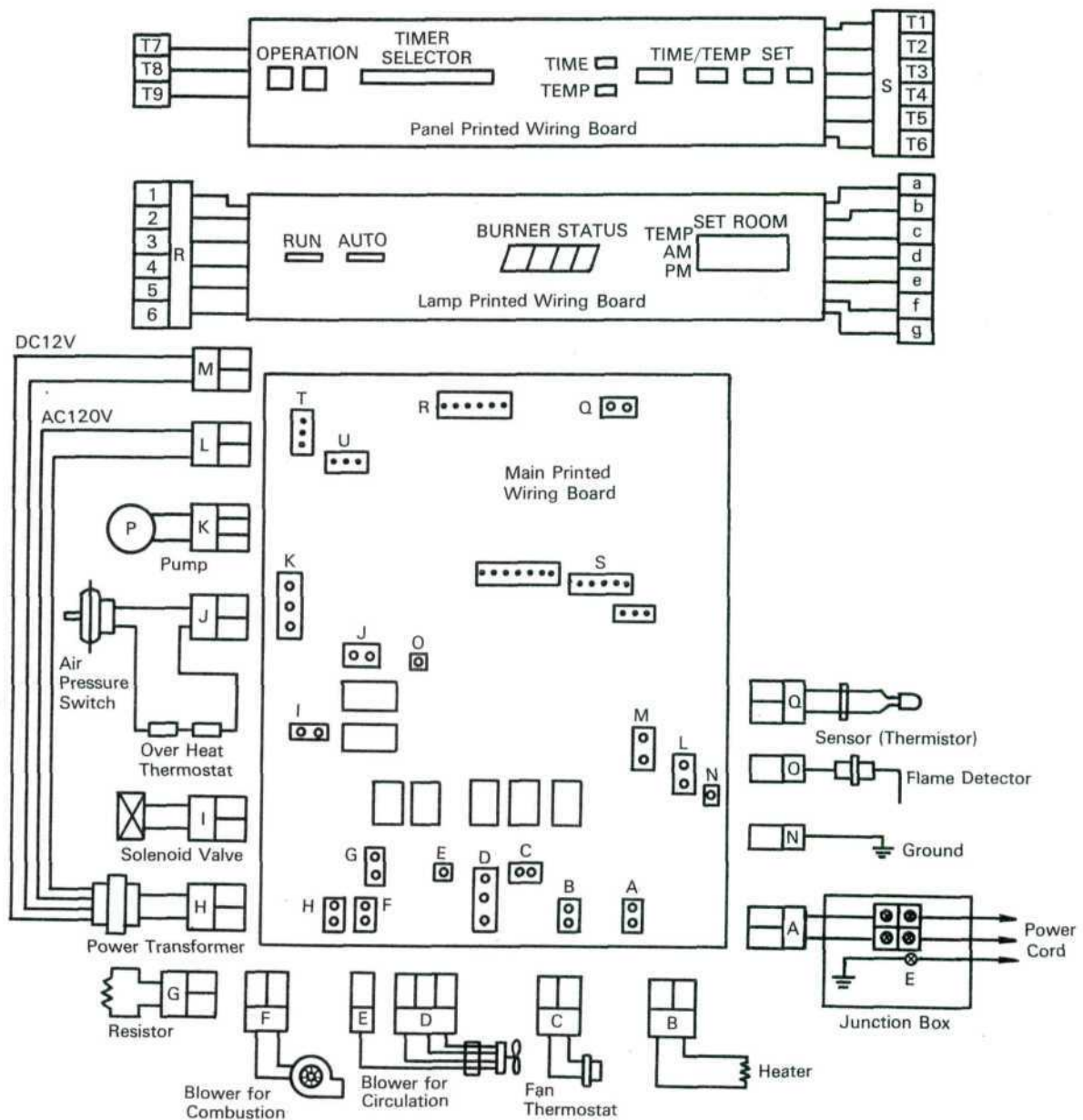


figure 7-1 Monitor 40

MONITOR HEATING SYSTEMS

Section 7: Electrical System

Printed Circuit Wiring Diagram

CONNECTION OF LEAD WIRES

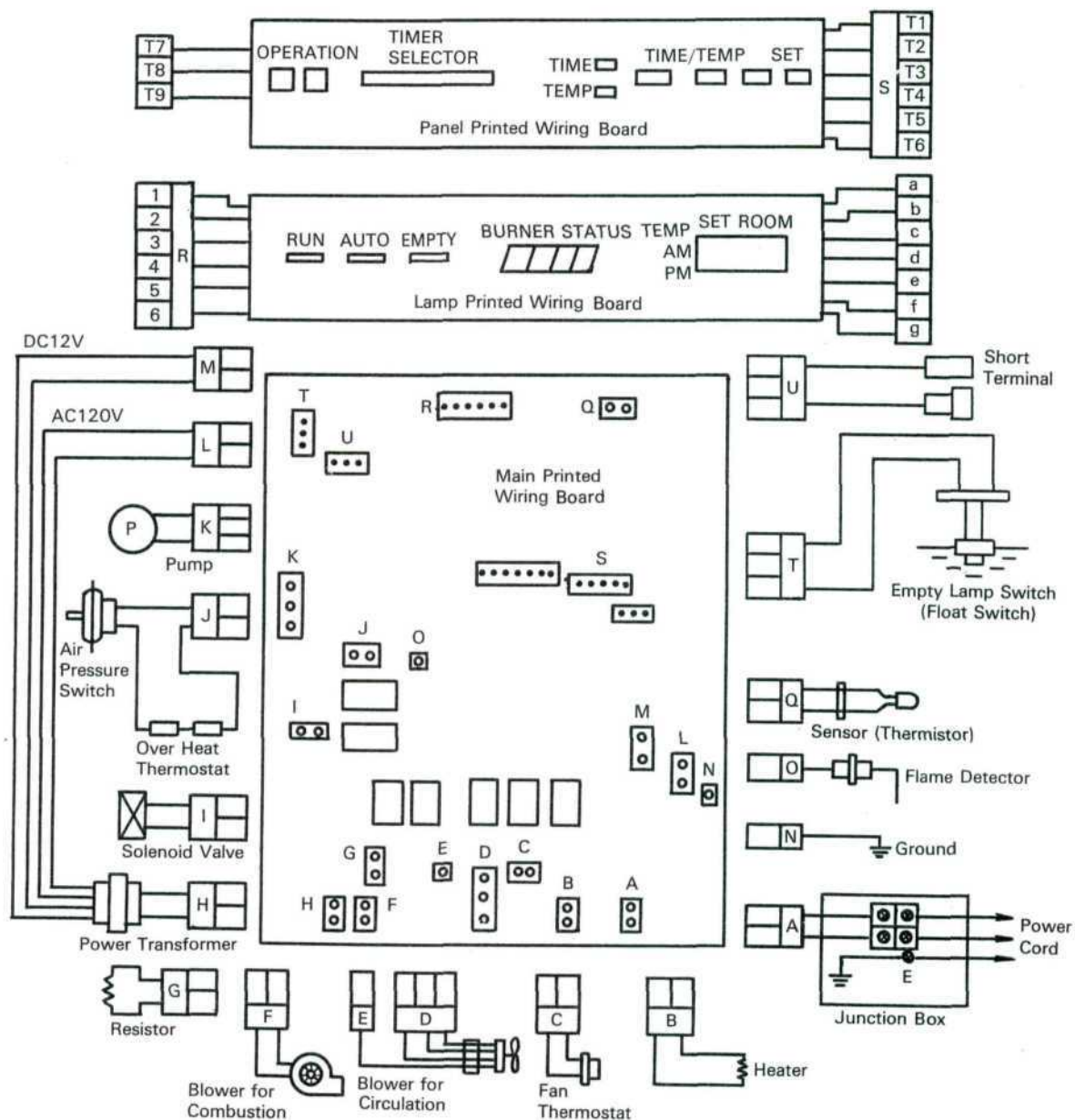
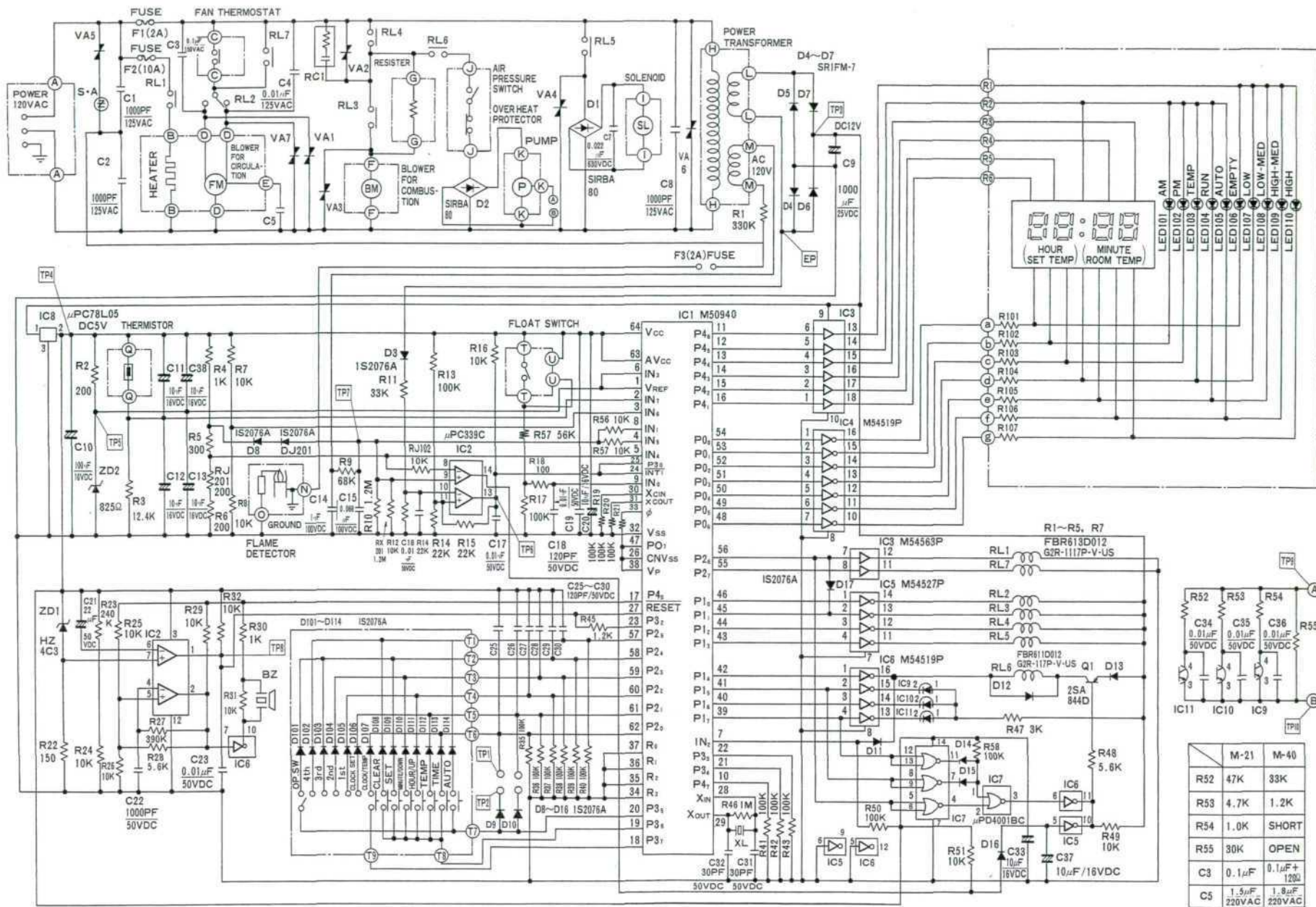


figure 7-2 Monitor 21

MONITOR HEATING SYSTEM

Section 7: Electrical System

Schematics

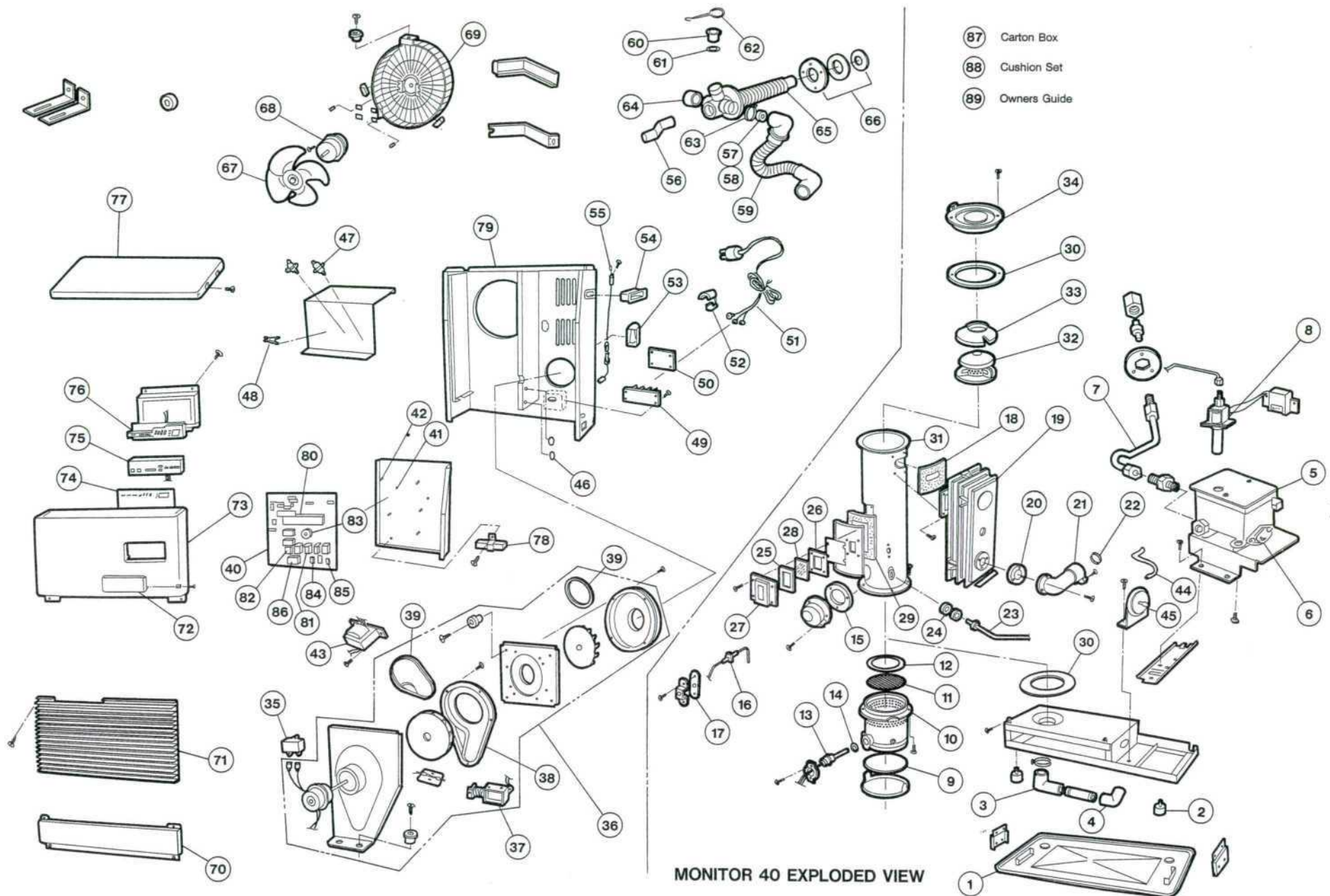


	M-21	M-40
R52	47K	33K
R53	4.7K	1.2K
R54	1.0K	SHORT
R55	30K	OPEN
C3	0.1 μ F	0.1 μ F + 12SD
C5	1.5 μ F 220VAC	1.8 μ F 220VAC

**MONITOR HEATING SYSTEM
EXPLODED VIEWS AND PARTS LIST**

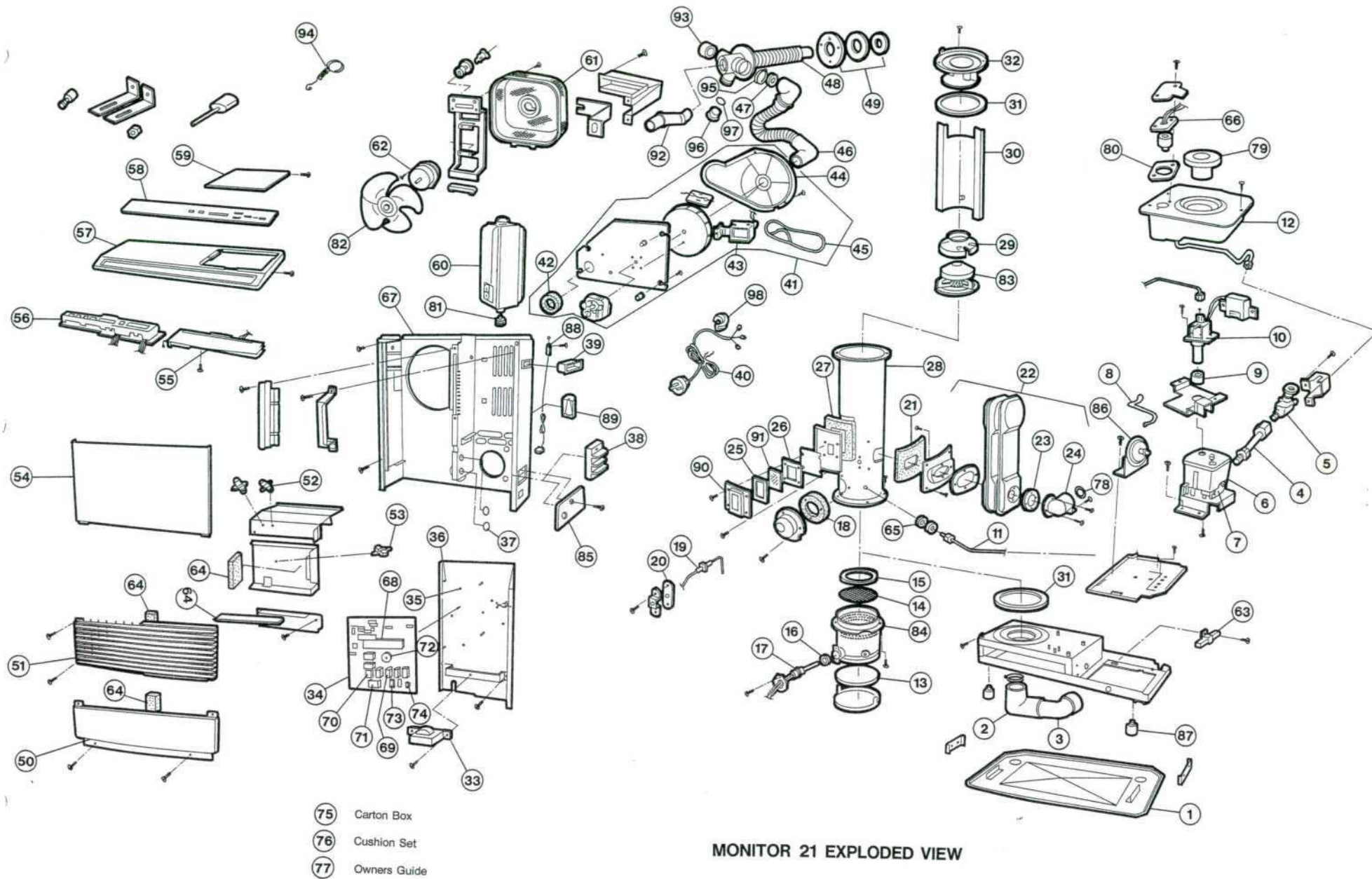
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MONITOR 40



MONITOR 40 SERVICE PARTS LIST

ITEM NO.	PART NO.	DESCRIPTION	ITEM NO.	PART NO.	DESCRIPTION	
1	6300	SPIII TRAY	52	4833	CORD BUSHING	56
2	6185	LEG	53	6037	LEVEL GUIDE	
3	6301	AIR SUPPLY HOSE (A)	54	6138	CARRYING HANDLE	
4	6302	AIR SUPPLY HOSE (B)	55	6186	SENSOR ASSY	
5	6303	CONSTANT LEVEL VALVE	56	4004	JOINT PIPE	
6	6304	CONSTANT LEVEL VALVE STRAINER	57	6328	AIR DAMPER (E)	
7	6305	FUEL PIPE	58	6329	AIR DAMPER (S)	
8	6306	SOLENOID PUMP	59	6145	AIR SUPPLY HOSE ASSY	
9	6307	GASKET (1)	60	4014	EXHAUST OUTLET CAP	
10	6308	BURNER	61	4016	AIR PORT O RING	
11	6309	GASKET (2)	62	4006	PIPE HOLDER	
12	6310	GASKET (2)	63	4008	HOSE BAND	
13	6311	HEATER	64	4805	AIR OUTLET CAP	
14	6115	GASKET (3)	65	6147	FLUE PIPE ASSY	
15	6117	HEATER COVER PACKING	66	6148	SLEEVE FLANGE SET	
16	6312	FLAME DETECTIVE PLUG	67	6075	FAN	
17	6119	PLUGPACKING	68	6330	CIRCULATION MOTOR	
18	6313	GASKET (4)	69	6331	BLOWER GUARD	
19	6314	HEAT EXCHANGER ASSY	70	6332	UNDER COVER	
20	6122	GASKET (6)	71	6333	LOUVER	
21	6123	EXHAUST DUCT	72	6334	CONTROL COVER	
22	6176	O-RING (P39)	73	6335	FRONT COVER	
	6315	OIL SUMP PIPE	74	6336	LAMP PANEL	
	6164	JOINT SEAL PACKING	75	6154	SWITCH ASSY	
25	6124	WINDOW GASKET	76	6155	LAMP ASSY	
26	6125	WINDOW FRAME GASKET	77	6337	TOP COVER	
27	6070	WINDOW PLATE <i>WINDOW FRAME</i>	78	6338	RESISTOR	
28	6069	WINDOW GLASS	79	6339	CABINET ASSY	
29	6316	WINDOW BASE GASKET	80	6167	MICROPROCESSOR (M50940)	
30	6317	CHAMBER GASKET	81	6168	RELAY (A)	
31	6318	COMBUSTION CHAMBER ASSY	82	6169	RELAY (B)	
32	6319	COMBUSTION RING ASSY	83	6171	BUZZER	
33	6320	BURNER CAP	84	6172	FUSE (250V 10A)	
34	6321	CHAMBER CAP	85	6173	FUSE (250V 2A)	
35	6322	CONDENSER (2.5) MFD)	86	6340	CAPACITOR (1.8MFD)	
36	6323	BLOWER ASSY	87	6341	CARTON BOX	
37	6142	DAMPER SOLENOID ASSY	88	6342	CUSHION SET	
38	6324	SUCTION CASE A ASSY	89	1143	OWNERS GUIDE	
39	6144	SEAL PACKING	90	6187	IC3 M54563P	
40	6325	PWB ASSY	91	6188	IC9-10-11 PHOTO COUPLER	
41	6134	PWB SPACER CLIP (A)	92	6190	BASE TRAY RETAINER	
42	6135	PWB SPACER CLIP (B)	93	6194	WALL CLAMPS	
43	6132	POWER TRANSFORMER	94	6195	IGNITER BRACKET	
44	6326	AIR LINE	95	6196	FLAME ROD BRACKET	
45	6343	AIR PRESSURE SW	96	6197	SCREW SET FOR FLUE PIPE	
46	6136	RUBBER BUSH	97	6344	STRAINER GASKET	
47	6327	OVER HEAT PROTECTOR	98	6345	UNION NUT	
	6152	FAN THERMOSTAT	99	6346	IGNITOR COVER	
	6137	CORD CONNECTOR	100	6347	WIRING GUARD	
50	6032	JUNCTION BOX COVER	101	6348	MOTOR FOR COMBUSTION BLOWER	
51	6139	POWER SUPPLY CORD	102	8216	TOUCH-UP PAINT (WHITE)	



MONITOR 21 EXPLODED VIEW

MONITOR 21 SERVICE PARTS LIST

MONITOR 21 SERVICE PARTS LIST

ITEM NO.	PART NO.	DESCRIPTION	ITEM NO.	PART NO.	DESCRIPTION
1	6100	SPILL TRAY	50	6149	UNDER COVER
2	6101	AIR SUPPLY HOSE A	51	6150	LOUVER
3	6102	AIR SUPPLY HOSE B	52	6151	OVER HEAT PROTECTOR
4	6103	FUEL PIPE0	53	6152	FAN THERMOSTAT
5	6104	FUSIBLE VALVE	54	6153	FRONT COVER
6	6105	CONSTANT LEVEL VALVE	55	6154	SWITCH ASSY
7	6106	CONSTANT LEVEL VALVE STRAINER	56	6155	LAMP ASSY
8	6107	AIR LINE	57	6156	TOP COVER
9	6108	SOLENOID PUMP PACKING	58	6157	LAMP PANEL
10	6109	SOLENOID PUMP	59	6158	FUEL TANK COVER
11	6110	OIL SUMP PIPE	60	6159	FUEL TANK ASSY
12	6111	FUEL SUMP	61	6160	BLOWER GUARD
13	6112	GASKET (1)	62	6161	CIRCULATION MOTOR
14	6113	BURNER CLOTH	63	6162	RESISTOR
15	6114	GASKET (2)	64	6163	AIR PACKING SET
16	6115	GASKET (3)	65	6164	JOINT SEAL PACKING
17	6116	HEATER	66	6165	FLOAT SWITCH
18	6117	HEATER COVER PACKING	67	6166	CABINET ASSY
19	6118	FLAME DETECTIVE PLUG	68	6167	MICROPROCESSOR (M50940)
20	6119	PLUG PACKING	69	6168	RELAY (A)
21	6120	GASKET (4)	70	6169	RELAY (B)
22	6121	HEAT EXCHANGER ASSY	71	6170	CAPACITOR (1.5MFD)
23	6122	GASKET (6)	72	6171	BUZZER
24	6123	EXHAUST DUCT	73	6172	FUSE (250V 10A)
25	6124	WINDOW GASKET	74	6173	FUSE (250V 10V)
26	6125	WINDOW FRAME GASKET	75	6174	CARTON BOX
27	6126	WINDOW BASE GASKET	76	6175	CUSHION SET
28	6127	COMBUSTION CHAMBER ASSY	77	1142	OWNERS GUIDE
29	6128	BURNER CAP	78	6176	O-RING (P39)
30	6129	BAFFLE ASSY	79	6177	OIL FILTER
31	6130	CHAMBER GASKET	80	6178	FLOAT SWITCH PACKING
32	6131	CHAMBER CAP	81	6179	FUEL TANK CAP
33	6132	POWER TRANSFORMER	82	6180	FAN BLADE
34	6133	PWB ASSY	83	6181	COMBUSTION RING ASSY
35	6134	PWB SPACER CLIP (A)	84	6182	BURNER
36	6135	PWB SPACER CLIP (B)	85	6183	JUNCTION BOX COVER
37	6136	PUBBER BUSH	86	6184	AIR PRESSURE SW
38	6137	CORD CONNECTOR	87	6185	LEG
39	6138	CARRYING HANDLE	88	6186	SENSOR ASSY
40	6139	POWER SUPPLY CORD	89	6037	LEVEL GUIDE
41	6140	BLOWER ASSY	90	6068	WINDOW PLATE
42	6141	BLOWER MOUTH PACKING	91	6069	WINDOW GLASS
43	6142	DAMPER SOLENOID ASSY	92	4004	JOINT PIPE
44	6143	SUCTION CASE	93	4805	AIR OUTLET CAP
45	6144	SEAL PACKING	94	4006	PIPE HOLDER
46	6145	AIR SUPPLY HOSE ASSY	95	4008	HOSE BAND
47	6146	AIR DAMPER	96	4014	EXHAUST OUTLET CAP
48	6147	FLUE PIPE ASSY	97	4016	AIR PORT O RING
49	6148	SLEEVE FLANGE SET	98	4833	CORD BUSHING